SESSION 4

Feasibility and Design Audits

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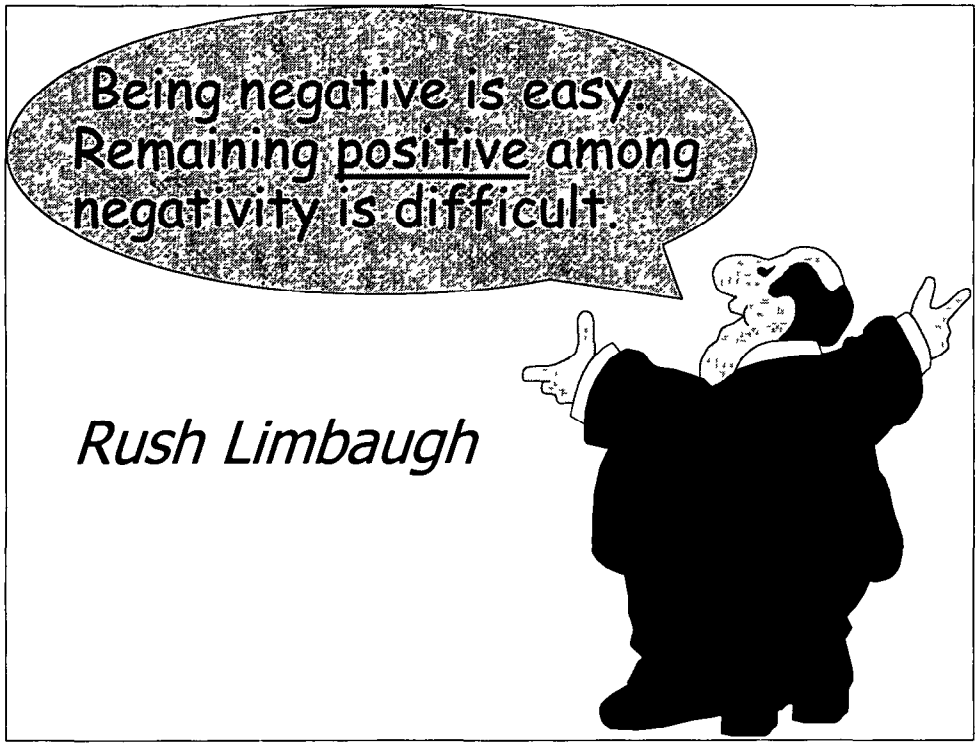
The Pennsylvania Department of Transportation's (PennDOT's) Project Development Process requires the involvement of many, many Agencies and steps to deliver a final project. This slide contains many; but, it is not all. In fact, it is not nearly all involved.

Does an Agency need another step and review????

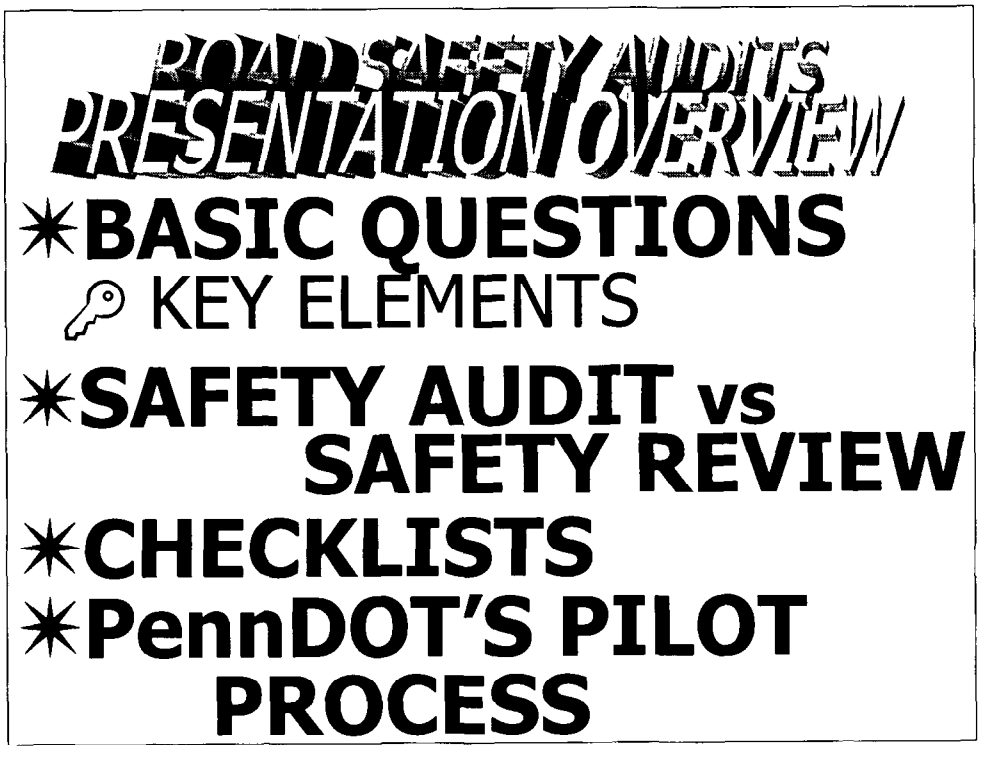
This presentation will outline the experiences that District 10 of PennDOT had with the Road Safety Audit Process. It will hopefully provide insight to help an Agency determine if and how it may wish to adapt the process for use.

There are many things that one may hear when attempting to add an additional step in the already complicated project development process.

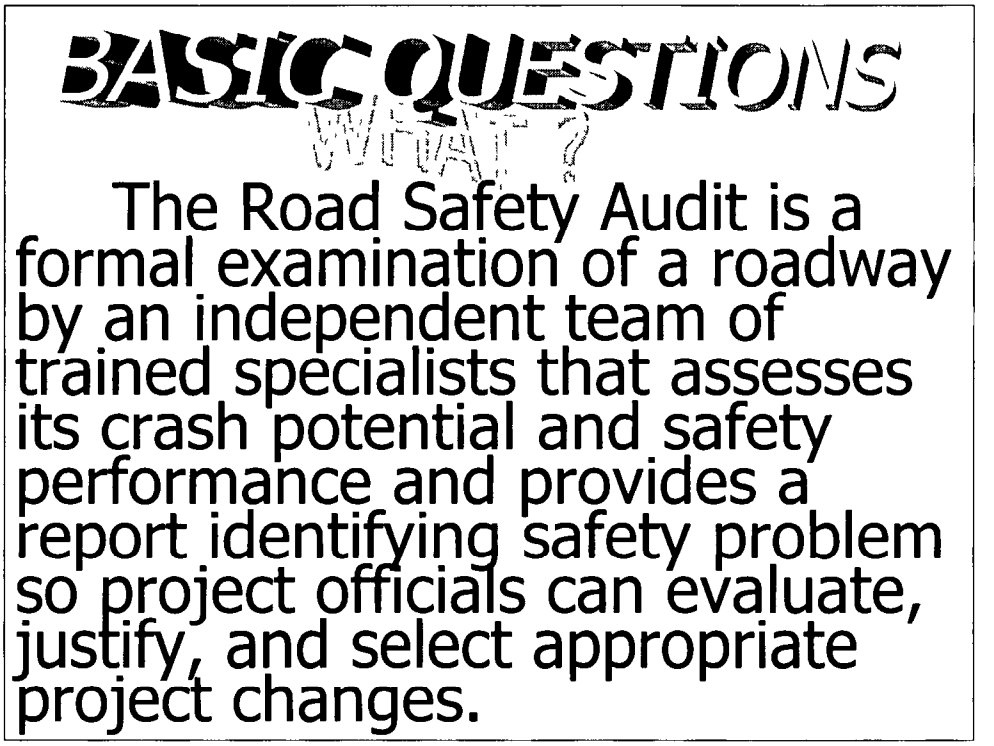
District 10's pilot process results should dispel the many preconceived fears and misconceptions often associated with change.



The radio talk show personality, Rush Limbaugh, made this statement regarding one of his conservative views. Although not profound, it is very appropriate when attempting to show the benefits of a change in a procedure or something new.



This is an overview of the presentation.



This is a very good definition of the Road Safety Audit Process.

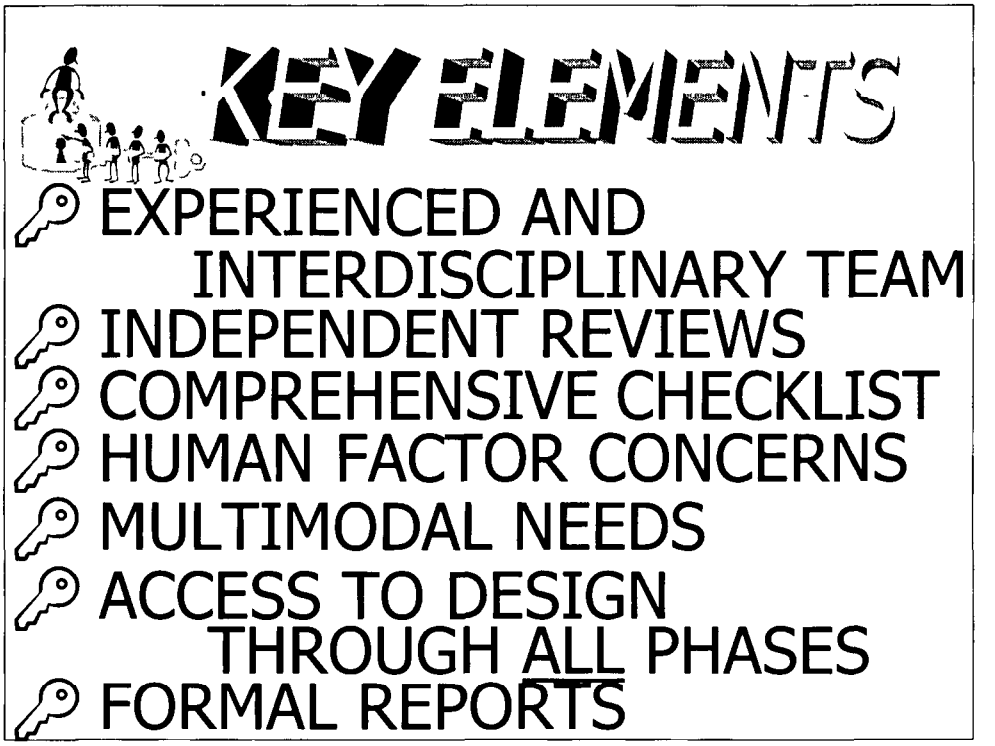
BASIC QUESTIONS

WHY?

- "STRICT ADHERENCE TO STANDARDS AND GUIDELINES MAY NOT ALWAYS BE ENOUGH"
- "THERE MAY BE A NEED FOR FORMALIZING A PROCEDURE FOR SAFETY EVALUATIONS TO ENSURE CONSISTENCY, SO THAT SAFETY IS BUILT INTO TRANSPORTATION FACILITIES FROM THE START"

These are quotes from a document containing research by The Pennsylvania Transportation Institute of the Pennsylvania State University for PennDOT that state WHY the process may be needed.

Note that there where limited processes in project development that is geared to safety. None that focuses purely on safety and with considerations from all road users.



This slide describes the KEY ELEMENTS of the Road Safety Audit Process.

* Reviews are conducted by a team of **experts** from **all** disciplines of highway engineering and even includes additional facets, such as Human Factors, Law Enforcement and Risk Management.

* Reviews are made by a Team INDEPENDENT from those involved in the design of the project. This ensures that it remains resistant to the pressures and constraints often found in the design process.

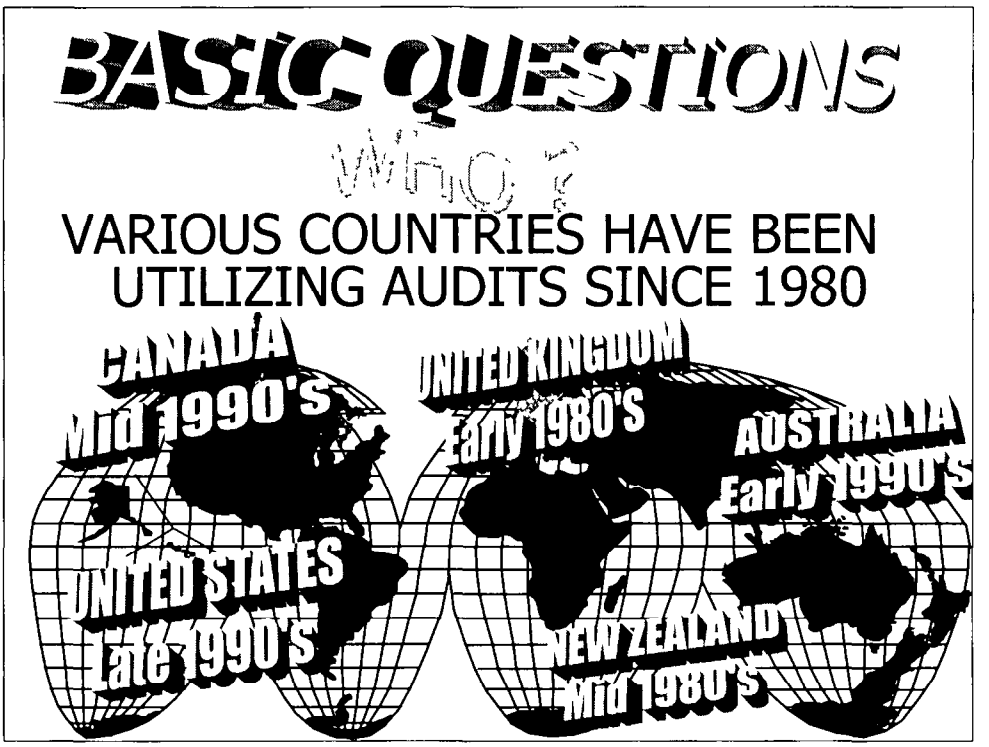
* COMPREHENSIVE CHECKLISTS are used to ensure that all safety concerns are considered. Different checklists are used during the various phases of the design process. The checklists do not emphasize compliance with Design Standards, rather they attempt to raise possible safety concerns with less obvious elements and deficiencies.

* HUMAN FACTORS are emphasized. After all, over 90% of crashes occur because of driver error. The Road Safety Audit Process attempts to anticipate potential problems based on HUMAN FACTORS. Two classic examples are eliminating skewed intersections and left turns when possible because of difficulties associated with the older driver, and removing fixed objects outside a curve with no crash history because speeds will increase with a new road surface.

* The needs of **all road users** are considered in the Road Safety Audit Process. Examples include pedestrians, bicycles, large trucks, buses, railroads, etc.

* The Road Safety Audit Process has access to the design **continually** through the design process. This allows safety to be a more integral part of the design of the Transportation Facility.

* FORMAL REPORTS are generated by the Road Safety Audit Team after each review; and a response is prepared by the Design Team stating actions taken or why actions were not taken.

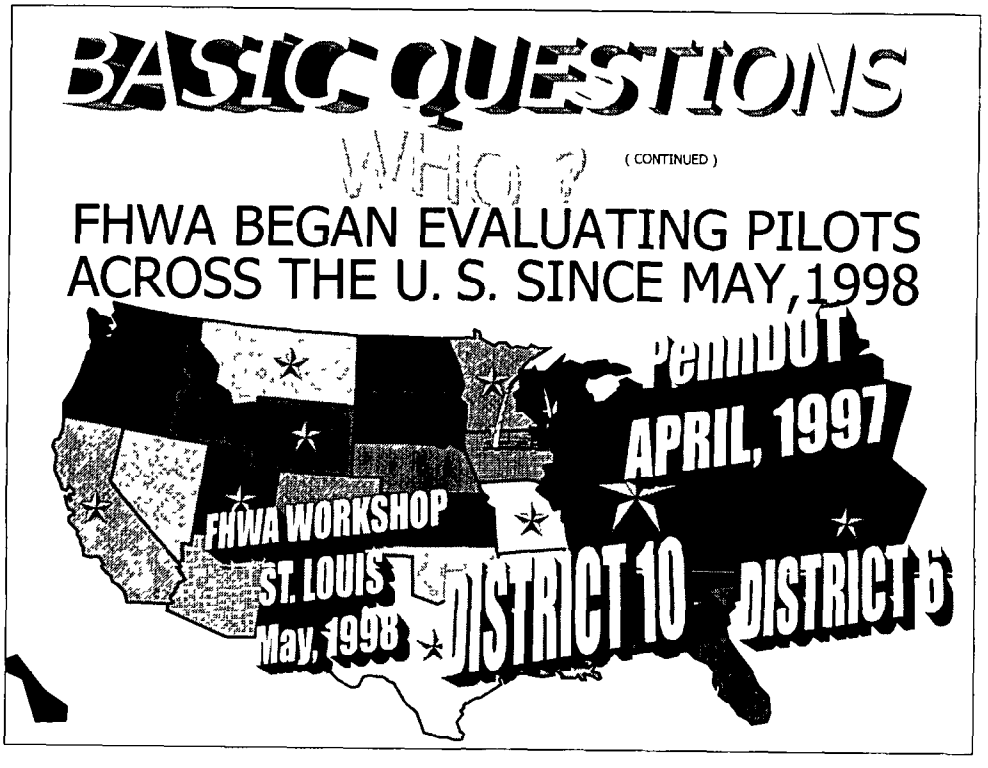


The Road Safety Audit Process has its origins in the United Kingdom beginning back in the early 1980's.

New Zealand, Australia, and Canada have also been utilizing the process.

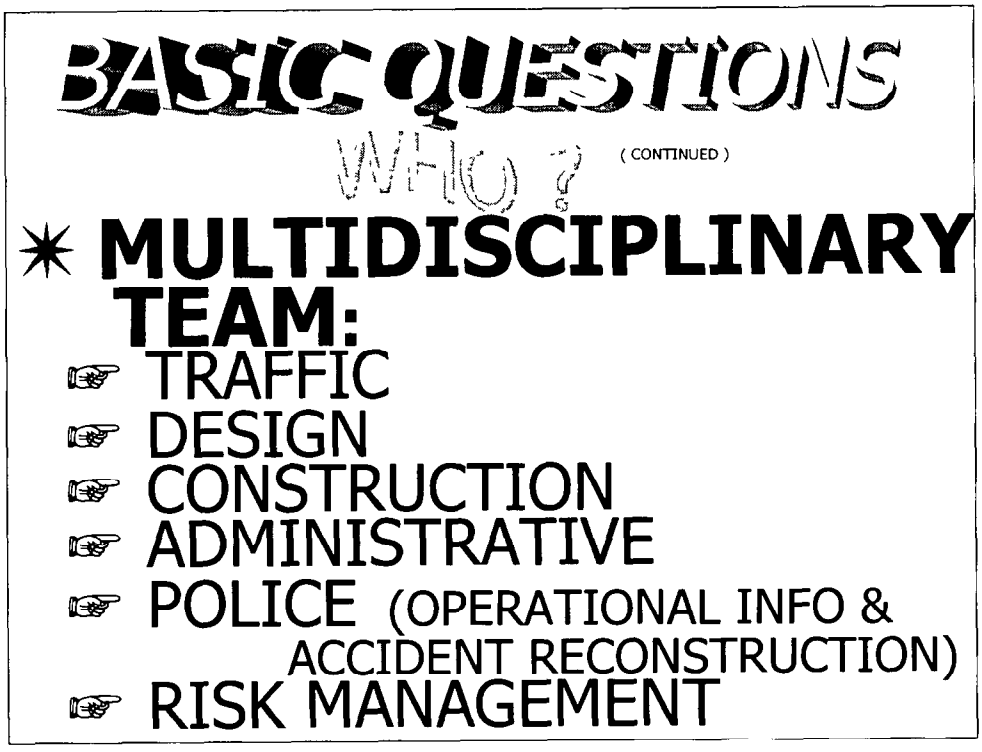
The United States is now taking a close look at its benefits.

Keep in mind that the US, and especially Pennsylvania, is and has been very aggressive in incorporating safety into the development of projects. Other countries may not have been so aggressive because of the age of the roadway system.

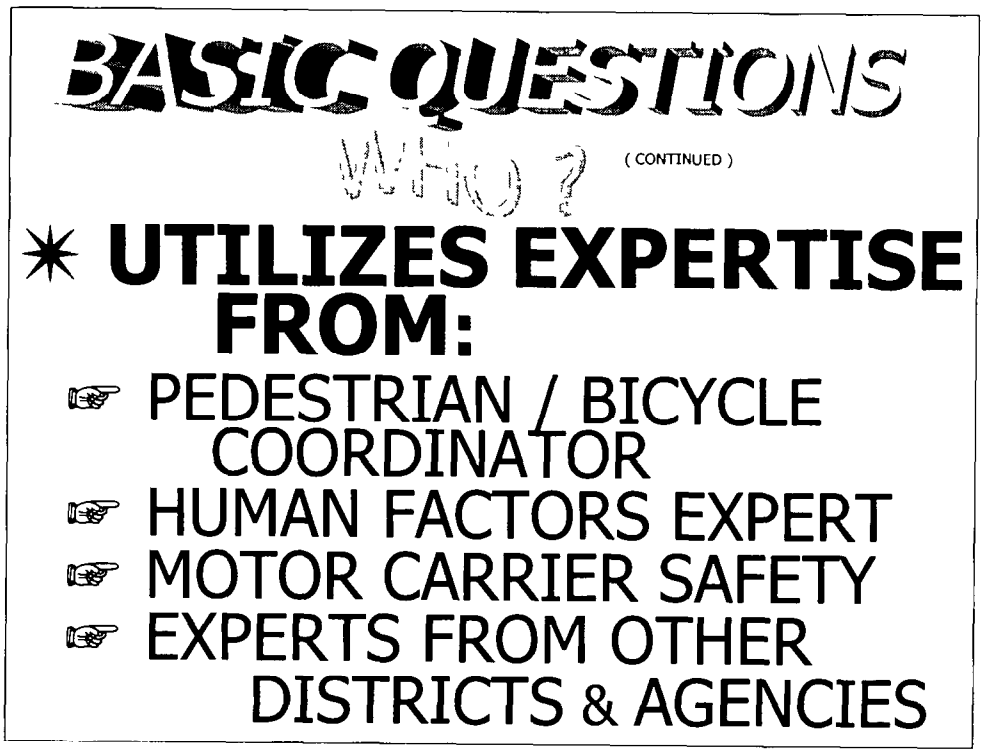


PennDOT has been piloting the Road Safety Audit Process since April of 1997 and is slightly ahead of the FHWA's initiative.

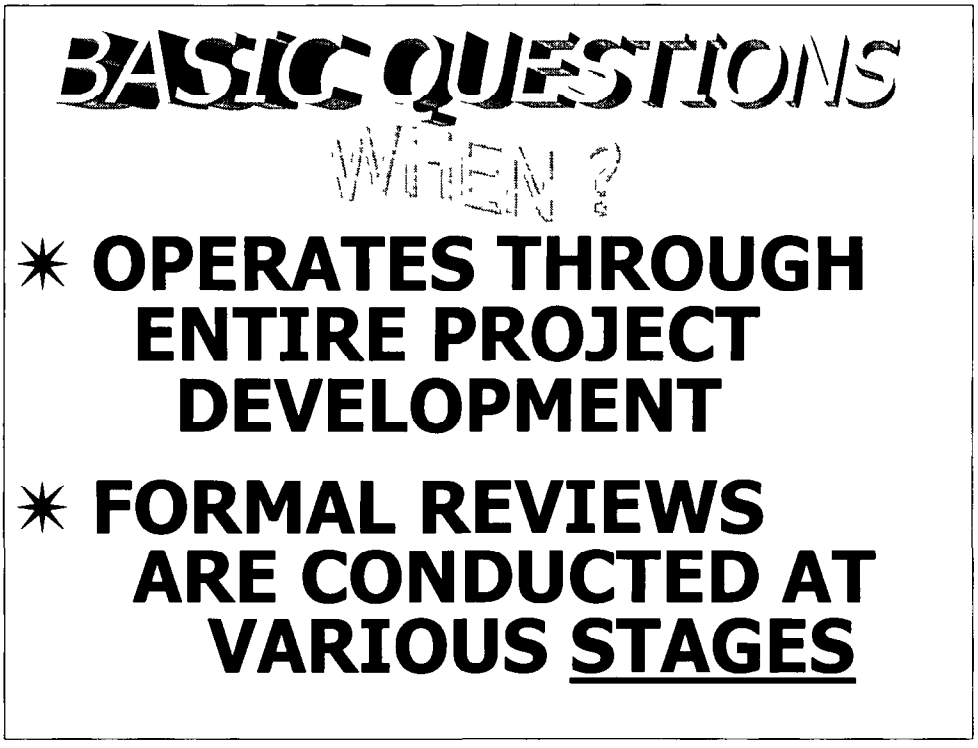
PennDOT gave a brief presentation of the experiences of the pilot in the Workshop held in St. Louis, MO in May of 1998.



The Multidisciplinary experience should consist of the following talents...

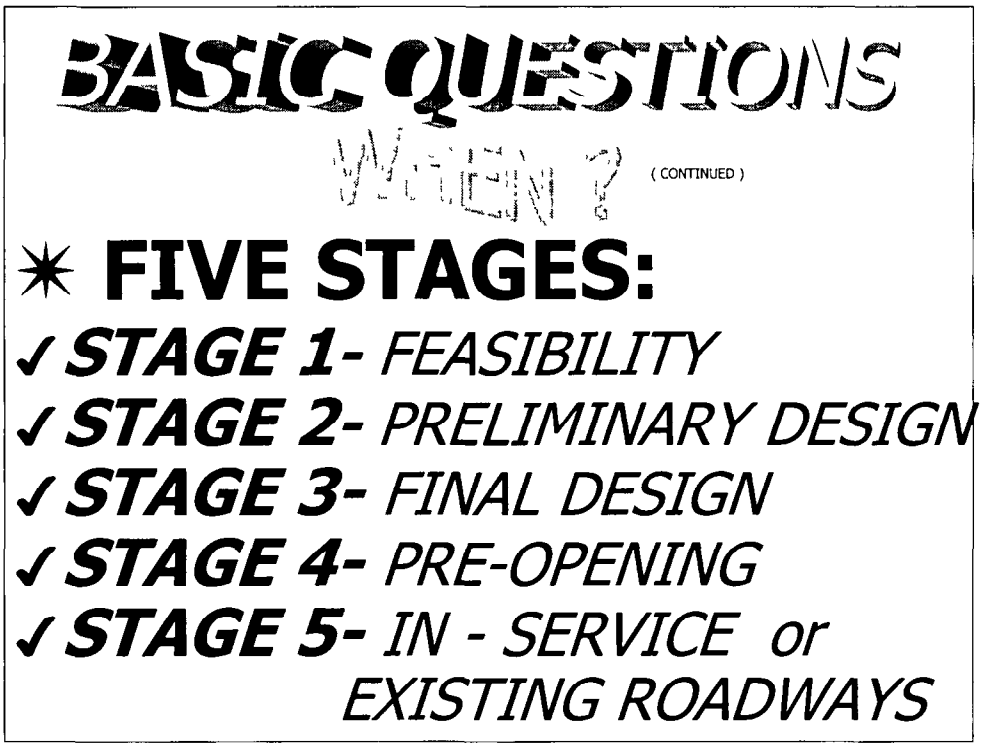


Not all experience and knowledge may be available within a team of experts. Experience is needed from other facets of safety and used as resources.

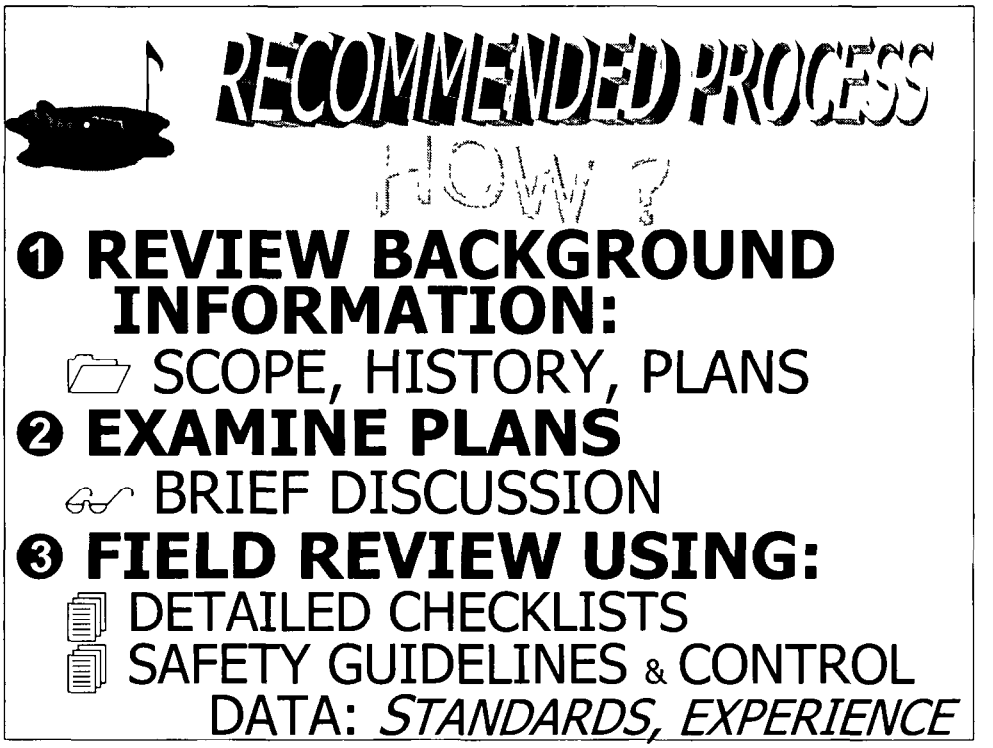


* The Road Safety Audit Process is not a one time review. However, it is intended to operate throughout the entire Project Development Process.

* FORMAL REVIEWS are conducted at up to five stages throughout the development of a project.



There are five distinct phases at which a review is to be conducted. Not all are necessary nor practical. Only experience with the process will allow one to determine how and when the reviews should occur.



These next two slides outline the basic question: "**HOW** is the Road Safety Audit implemented?"

* Once the projects are known, the Team should review all of the available **BACKGROUND INFORMATION** so there is a good understanding of the projects' history, scope, purpose and constraints. Of great benefit, is all of the needs of all Stakeholders (GOOD LUCK!).

* The plans need to be examined, if available, but a plan review supports the field review.

* **FIELD REVIEWS** should be done at specific stage**s** throughout the design. Field reviews with an interdisciplinary team of experts is another key, and very productive, element of the Road Safety Audit Process

* Detailed **CHECKLISTS** are reviewed and completed to stimulate thought and ensure that all safety concerns are considered.

* Everything that the experts know, have learned, use in the job, or can deduce is used to brainstorm safety concerns. Policies, standards, stakeholder input, and most important, experience is what makes the Road Safety Audit Process beneficial.

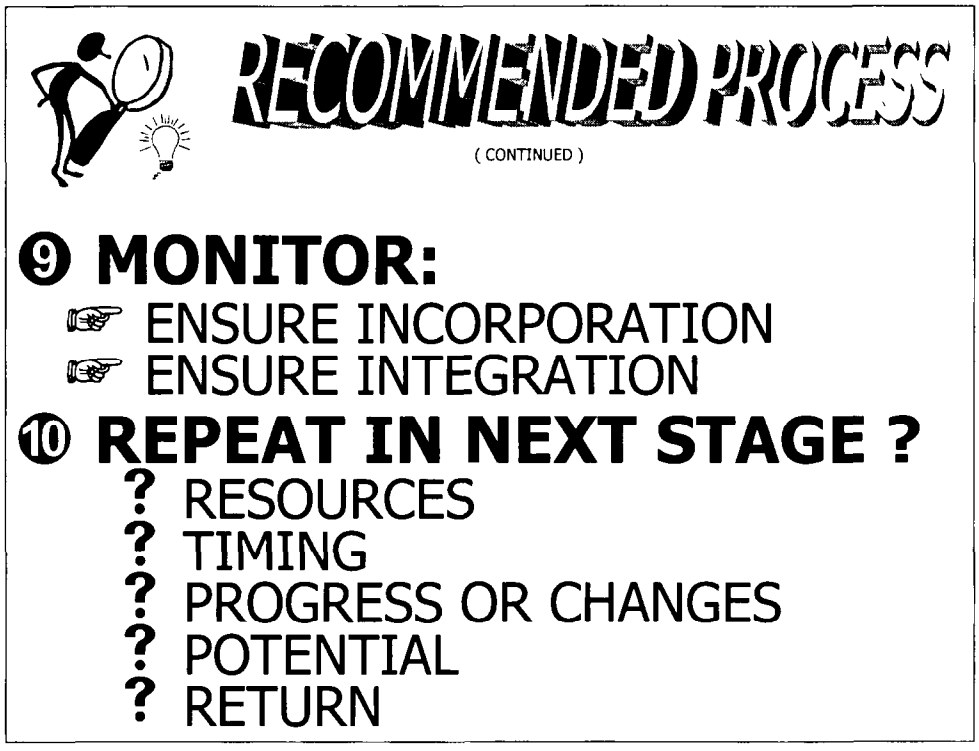
* Naturally, all available information and experience need to be utilized to brainstorm potential concerns. Human Factors and the needs of all road users need to be considered for brainstorming potential problems.

* The Team needs to reach consensus of items that will be identified. The Team needs consensus so recommendations that may cause conflict can be identified as an Audit need and not self serving.

* FORMALLY REPORT the identified CONCERNS to the Design Team. Various Countries that have been utilizing the Road Safety Audit Process also make recommendations. However, for reasons discussed later, the process may receive better BUY-IN if only concerns are cited, and the DESIGN Team assists in determining how the concern is addressed. A formal written report is prepared to the Design Team.

* RESOLUTION OF CONFLICTS between those responsible for the design and the Safety Audit Team, or any conflicts that may occur as a result of the Audit need to be resolved. (This is where a good understanding of the Audit Process will assist.) Conflicts involving money and time are the most common.

* All of the steps to this point are instrumental in allowing the most important step to occur ... INCORPORATE SOLUTIONS INTO DESIGN.



* Since the Road Safety Audit Team reviews a project up to 5 times during project development, the Team can continually monitor progress and, not only ensure incorporation into the project; but also **ensure integration of successful improvements into similar projects under design.**

* The entire procedure can be performed again, as soon as the project enters into the next phase of project development. Consideration is given:

*** Do you have human and monetary resources?**

*** Is there enough time? When does it need out?**

*** Has there been major progress or changes?**

*** What is the potential for change?**

*** What is the return that you may get?**

THIS IS A VERY IMPORTANT AND KEY TO UNDERSTANDING THE PROCESS

Most Agencies have an existing procedure built into project development to ensure that safety is incorporated into the project. This slide shows the differences in the generally accepted **SAFETY REVIEW (SR)** procedure and the **SAFETY AUDIT (SA)** Process.

* **SR** utilizes a small team with DESIGN expertise.//// **SA** utilizes a larger team with INTERDISCIPLINARY expertise.

* **SR** Teams are usually involved in the design or a similar design **/// SA** Teams are totally removed and totally unbiased

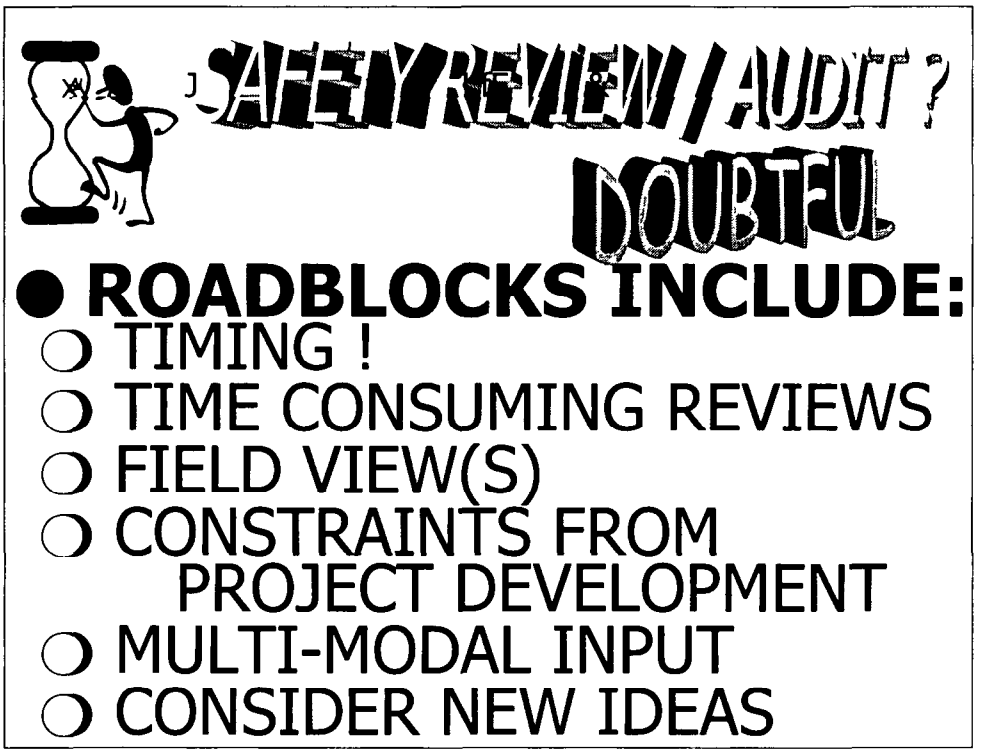
*** SR** teams normally do not perform a FIELD REVIEW.//// **SA** teams will perform 2 to 5 field reviews on a single project. Field reviews are extremely valuable in discerning safety concerns. Many concerns can only be discerned during a field review.

* **SR** teams review plans to ensure that all design features are in compliance with STANDARDS.//// **SA** teams utilize a comprehensive CHECKLIST that covers many design features not normally considered during the design of most projects.

* **SR** does not normally consider HUMAN FACTORS. Most crashes occur due to driver error.//// **SA** focuses on how drivers may react to certain highway features, including improvements, and discerns problems and concerns not normally considered.

* **SR** does not normally consider the needs of other modes of transportation.//// **SA** teams consider multi-modal safety concerns, including that of pedestrians, bicycles, large trucks, motorcycles, railroads, buses, etc.

* **SR** normally ensures that accident clusters are considered and remedial improvements are considered.//// **SA** attempts to anticipate crashes. This is a proactive approach.



CAN THE ROAD SAFETY AUDIT PROCESS AND THE SAFETY REVIEW PROCESS BE COMBINED?

Maybe, but it is doubtful. Major changes would be needed.

Roadblocks include:

* Timing is critical. More often than not, the timing of a Safety Review is way too late in project development to ensure incorporating the major types of changes often resulting from Safety Audits.

* Road Safety Audits are time consuming. There are many projects in the pipeline and not enough time to perform a detailed review on all projects.

* Safety Reviews do not normally include field views which requires time.

* Constraints of time and money need kept out.

* Multi-modal concerns are normally not considered in Safety Reviews. The checklists may feasibly be able to incorporate this benefit.

* New ideas are normally not considered in Safety Reviews. It is usually too late to "go back to the drawing board."

This slide briefly discusses the CHECKLISTS which are valuable tools for the Team to help stimulate the brainstorming of concerns.

* PennDOT's checklists were developed by The Pennsylvania Transportation Institute and are continually being evaluated for changes and additions. They were adapted from Austroads.

* They are very detailed so that all aspects are formally considered.

* However, they are intended to prompt thought and discussion among the Road Safety Audit Team. Considerable time can be spent on the various concerns; therefore, the Team should not feel obligated to do so knowing that they are to prompt thought.

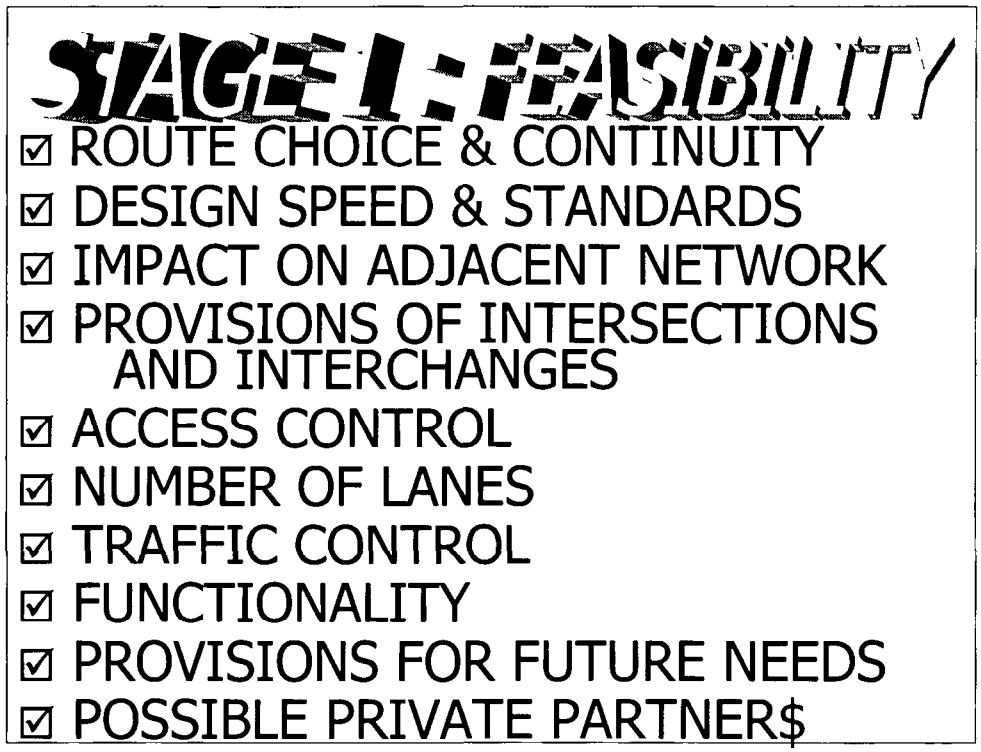
* Some safety concerns are formally considered during one stage and not another. Some are considered during several. The following slides will provide a small sample of the elements reviewed during each phase.

* Completing the checklists really forces you to remain focused on all safety issues.

* They are **not** a scorecard for the Design Team. The Term **AUDIT** may lead some to believe that it is to be used to check on the actions or lack of actions of a Design Team. **ABSOLUTELY INACCURATE!**

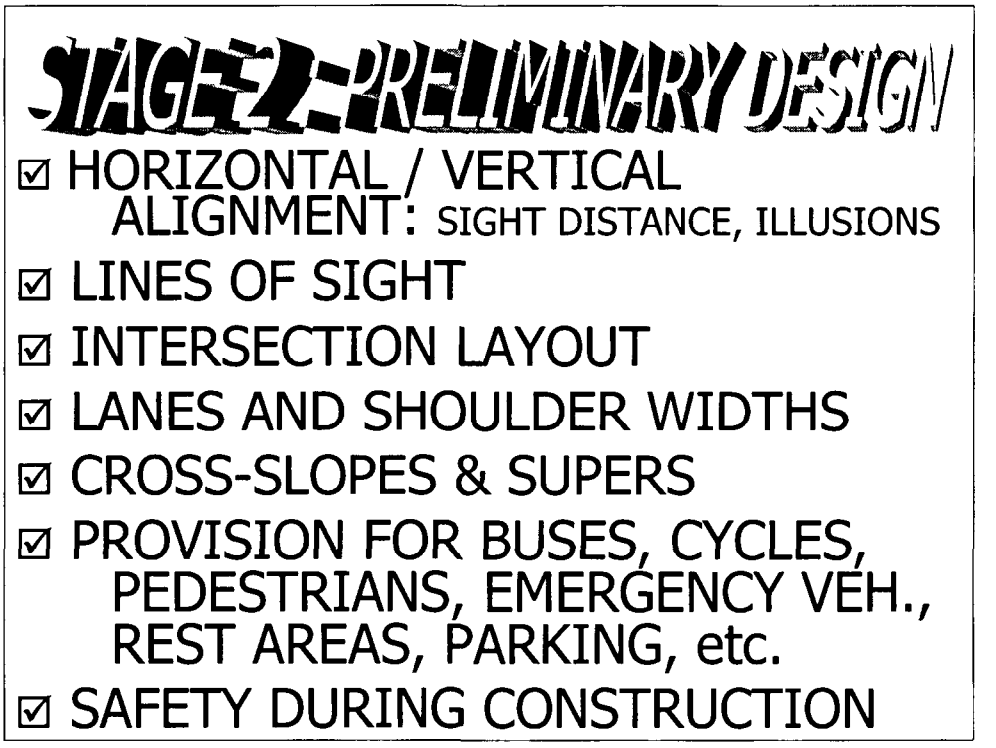
* PennDOT's checklists are included as a separate file for use on a Laptop Computer in the field or for hardcopy duplication. They are Wordperfect documents.

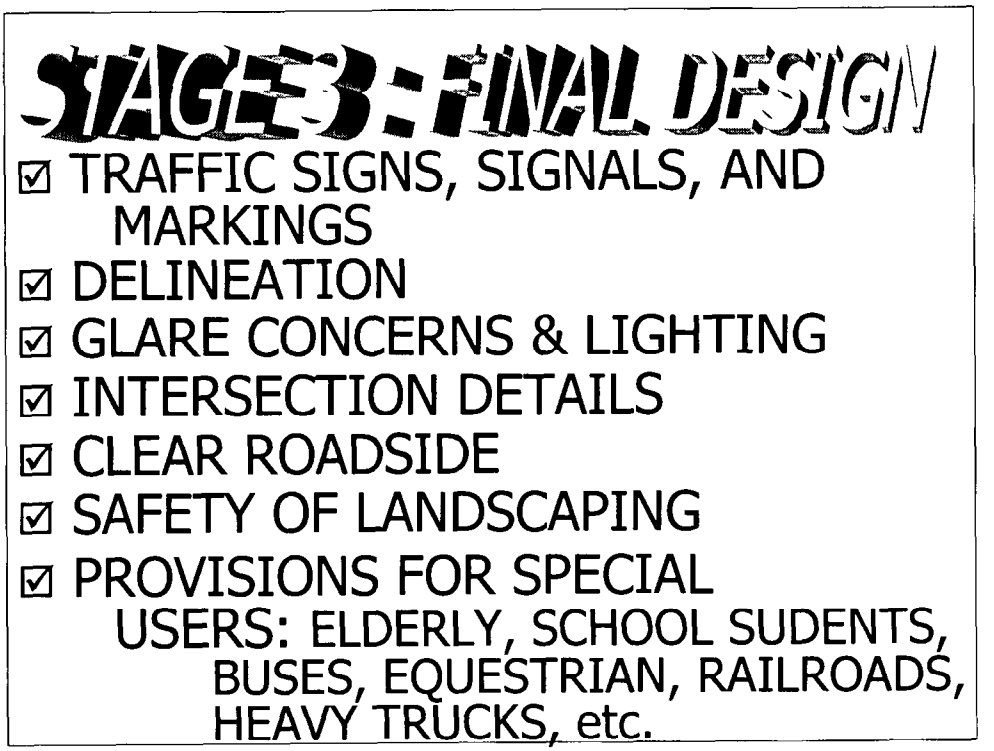
* The checklists are under close evaluation for possible changes, additions, deletions, etc. They are used as a tool, so making them as thorough and as high quality as possible will better serve the Team and the process. PennDOT is anticipating adding items to include WALKABLE COMMUNITIES and FHWA's OLDER DRIVER HANDBOOK in the near future.

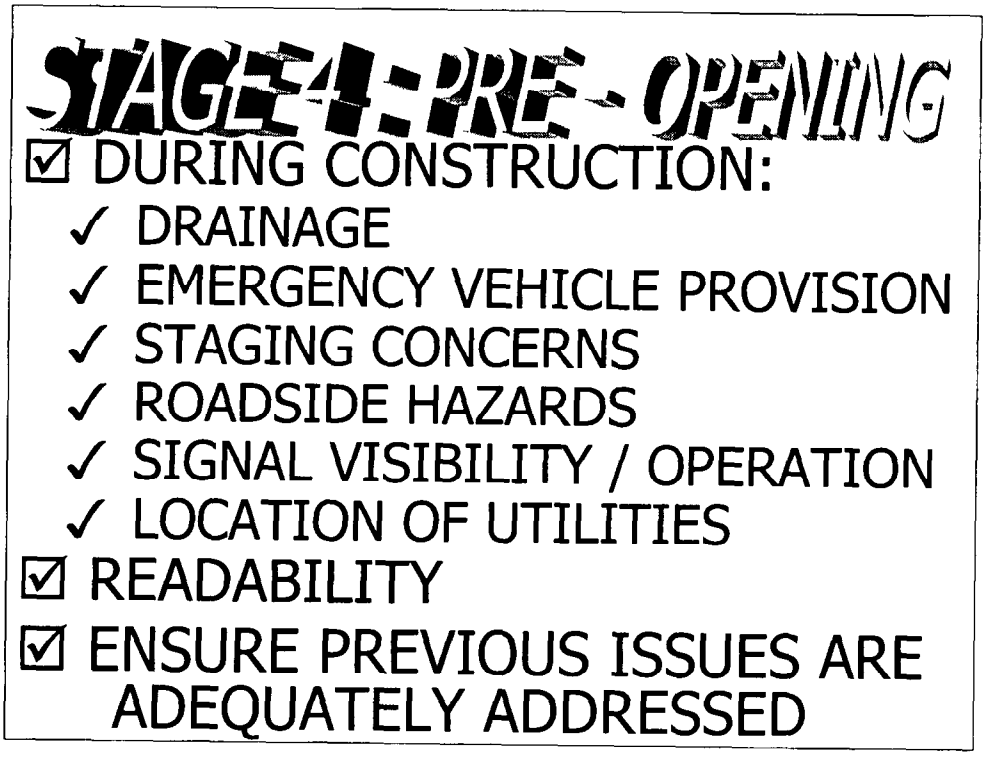


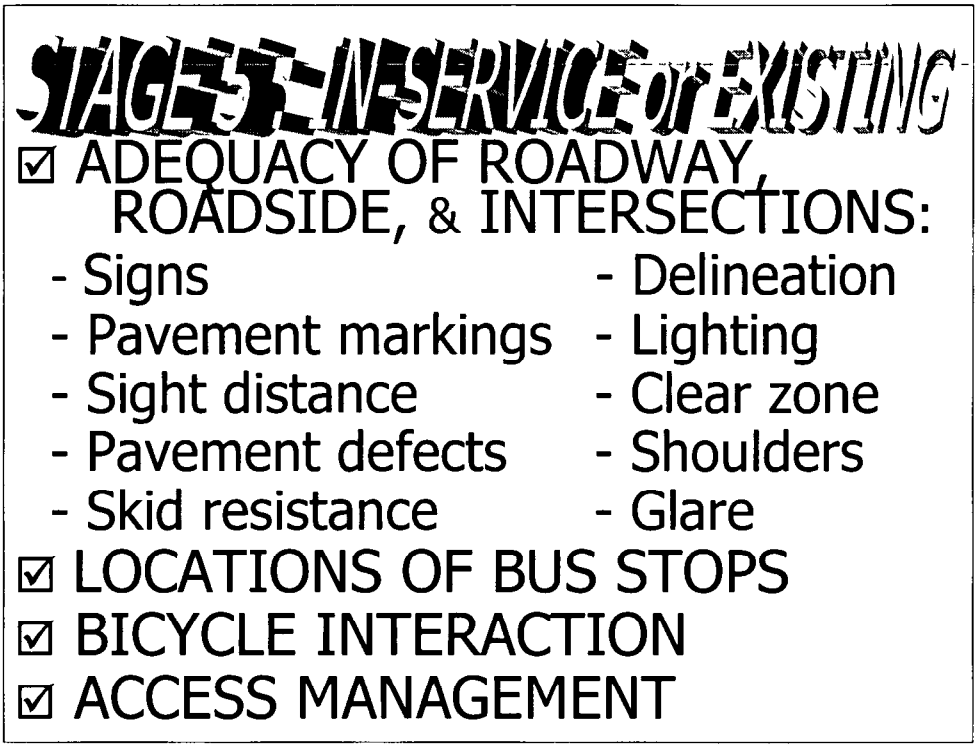
These next five slides touch on some of the items that are scrutinized during the different STAGES of the Road Safety Audit Process.

They are all self-explanatory.


STAGE 2 - PRELIMINARY DESIGN
☑ HORIZONTAL / VERTICAL ALIGNMENT: SIGHT DISTANCE, ILLUSIONS
☑ LINES OF SIGHT
☑ INTERSECTION LAYOUT
☑ LANES AND SHOULDER WIDTHS
☑ CROSS-SLOPES & SUPERS
☑ PROVISION FOR BUSES, CYCLES, PEDESTRIANS, EMERGENCY VEH., REST AREAS, PARKING, etc.
☑ SAFETY DURING CONSTRUCTION


STAGE 3 : FINAL DESIGN
☑ TRAFFIC SIGNS, SIGNALS, AND MARKINGS
☑ DELINEATION
☑ GLARE CONCERNS & LIGHTING
☑ INTERSECTION DETAILS
☑ CLEAR ROADSIDE
☑ SAFETY OF LANDSCAPING
☑ PROVISIONS FOR SPECIAL USERS: ELDERLY, SCHOOL SUDENTS, BUSES, EQUESTRIAN, RAILROADS, HEAVY TRUCKS, etc.

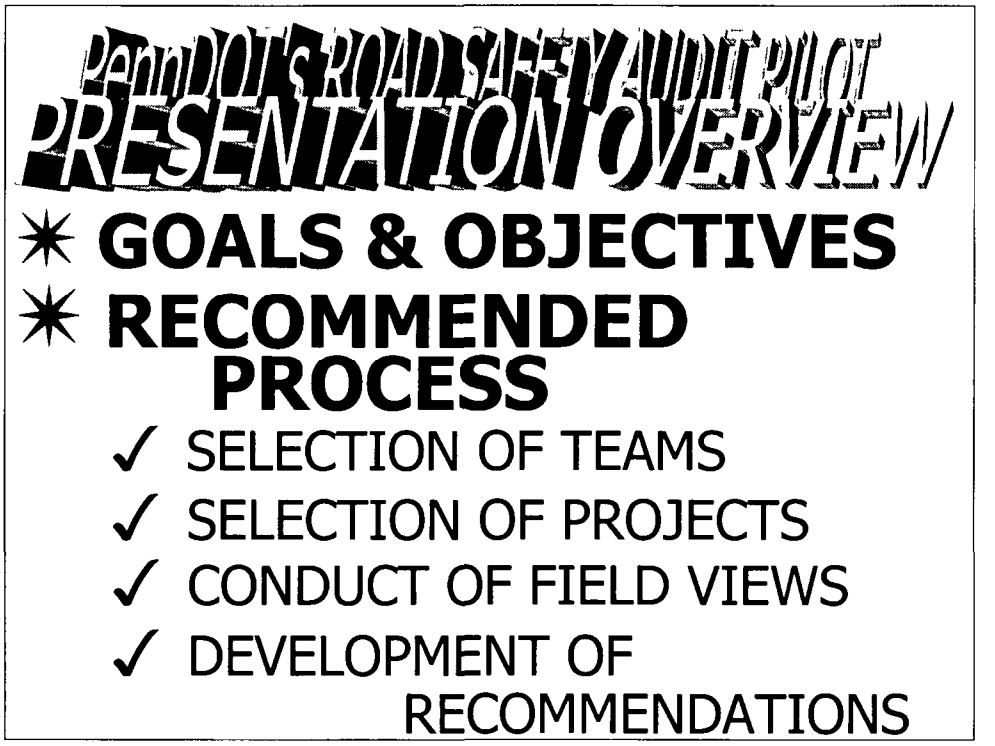

STAGE 4: PRE - OPENING
☑ DURING CONSTRUCTION:
✓ DRAINAGE
✓ EMERGENCY VEHICLE PROVISION
✓ STAGING CONCERNS
✓ ROADSIDE HAZARDS
✓ SIGNAL VISIBILITY / OPERATION
✓ LOCATION OF UTILITIES
☑ READABILITY
☑ ENSURE PREVIOUS ISSUES ARE ADEQUATELY ADDRESSED


STAGE 3 - IN-SERVICE or EXISTING
☑ ADEQUACY OF ROADWAY, ROADSIDE, & INTERSECTIONS:
- Signs
- Delineation
- Pavement markings
- Lighting
- Sight distance
- Clear zone
- Pavement defects
- Shoulders
- Skid resistance
- Glare
☑ LOCATIONS OF BUS STOPS
☑ BICYCLE INTERACTION
☑ ACCESS MANAGEMENT

This presentation details the ROAD SAFETY AUDIT PILOT Process that the Pennsylvania Department of Transportation **(PennDOT)** has been implementing since April, 1997. PennDOT is presently evaluating the Pilot for Statewide implementation.

This presentation was prepared by the Road Safety Audit Coordinator in PennDOT, District 10, located in Indiana, Pennsylvania. It is intended to inform Agencies responsible for the maintenance of roadways of how PennDOT has adapted the Road Safety Audit Process and details the experiences

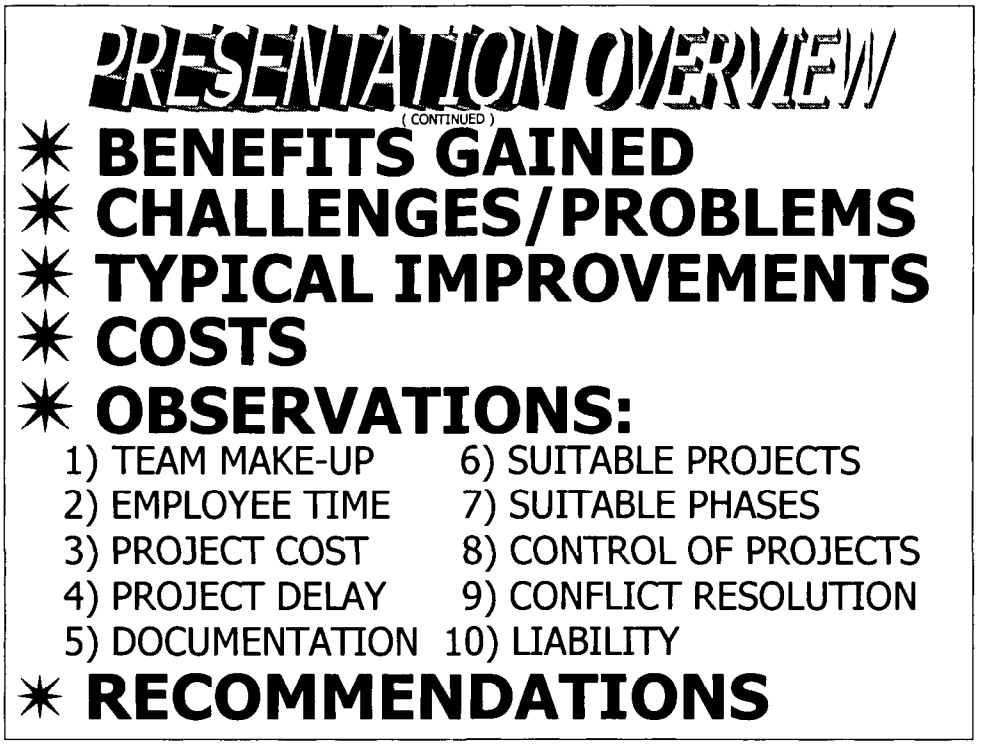
Hopefully, this can help an Agency in needing to "reinvent the wheel" in some of the needed procedures.



This is an OVERVIEW of the presentation.
* The GOALS AND OBJECTIVES of the Pilot will be stated.

* The RECOMMENDED PROCESS will be outlined:

SELECTION OF TEAMS
SLECTION OF PROJECTS
CONDUCT OF FIELD VIEWS
DEVELOPMENT OF RECOMMENDATIONS
are the major steps needed in conducting audits.



* The BENEFITS GAINED will be cited, with two interesting ones shown in greater detail.

* OBSERVATIONS were continually made and documented as variations in all aspects of the process were performed during the numerous audits. Focus was on ten key items.

* Most of the PROBLEMS ENCOUNTERED will be cited.

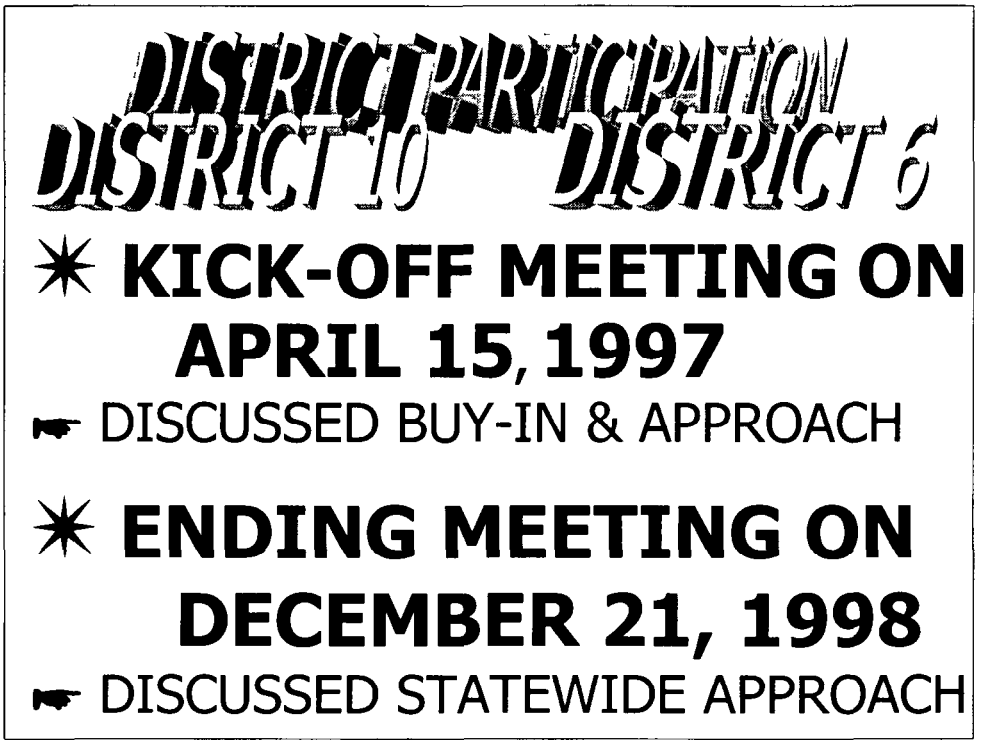
* RECOMMENDATIONS will be given to help benefit Agencies that will be considering implementing a Road Safety Audit Process.

PennDOT's GOALS AND OBJECTIVES of the Road Safety Audit Pilot are as follows:

*** Will the ROAD SAFETY AUDIT Process ADD VALUE to projects?**

*** Can the ROAD SAFETY AUDIT Process be implemented WITHIN EXISTING RESOURCES?**

*** Will the ROAD SAFETY AUDIT Process DELAY PROJECT DELIVERY?**

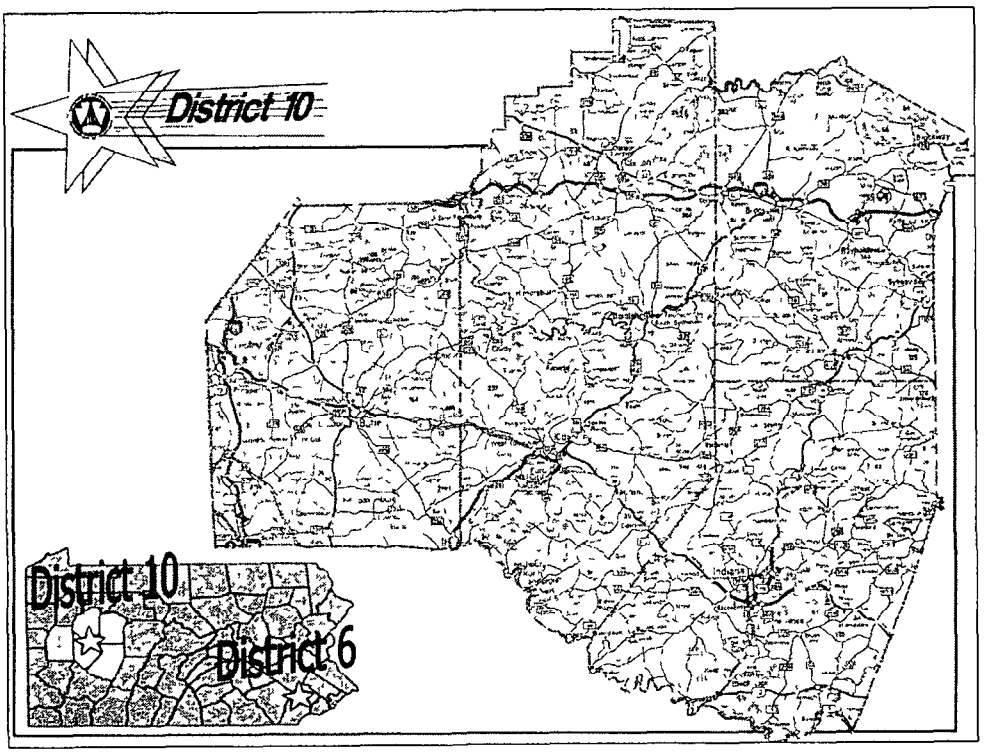


* Two Districts within PennDOT accepted the opportunity to take part of the Pilot: DISTRICT 10 and DISTRICT 6.

District 10 is mostly rural in nature. District 6 is located in the Philadelphia area and has large urban regions.

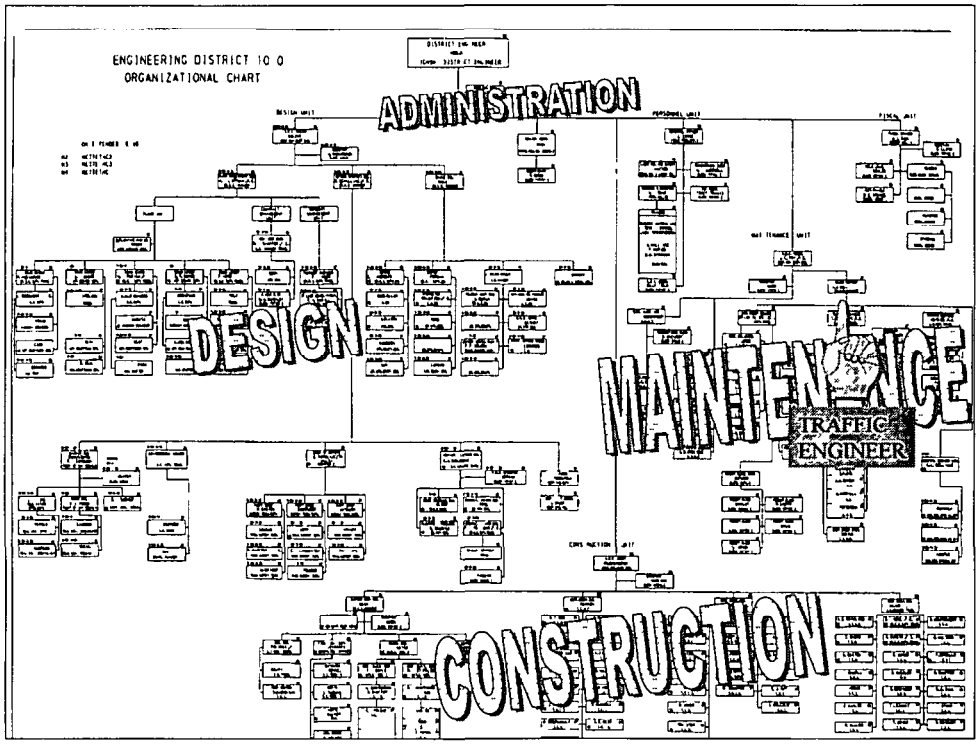
* PennDOT began its Pilot with a kick-off meeting on APRIL 15,1997 with representatives from FHWA's Washington, D.C. and Region 3 Office, and PennDOT's Bureau of Highway Safety and Traffic Engineering, Bureau of Design, and the two participating District Offices.

* The Pilot officially ended with a debriefing meeting on December 21, 1998 to determine how the Road Safety Audit Process should be implemented Statewide.



This slide shows the location of the 5 counties within District 10: Armstrong, Butler, Clarion, Indiana, and Jefferson Counties.

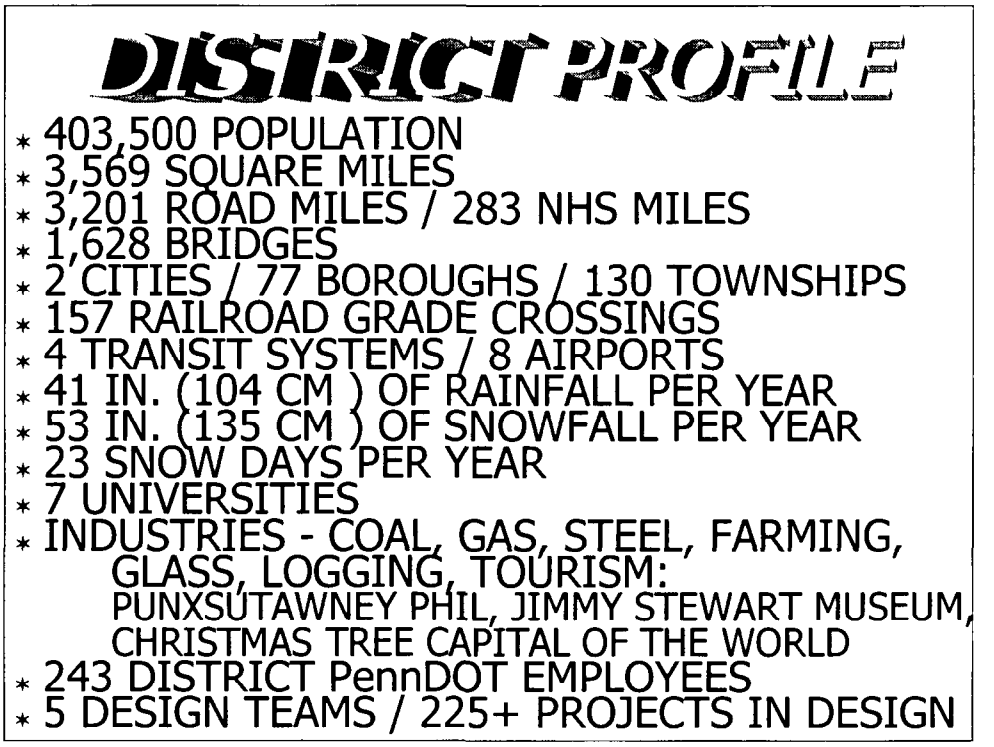
The Engineering District Office is located in Indiana, PA which is located approximately 50 miles Northeast of Pittsburgh, PA.



This slide gives a little knowledge of the structure of District 10.

There are 3 separate Units within District 10: DESIGN, CONSTRUCTION, and MAINTENANCE.

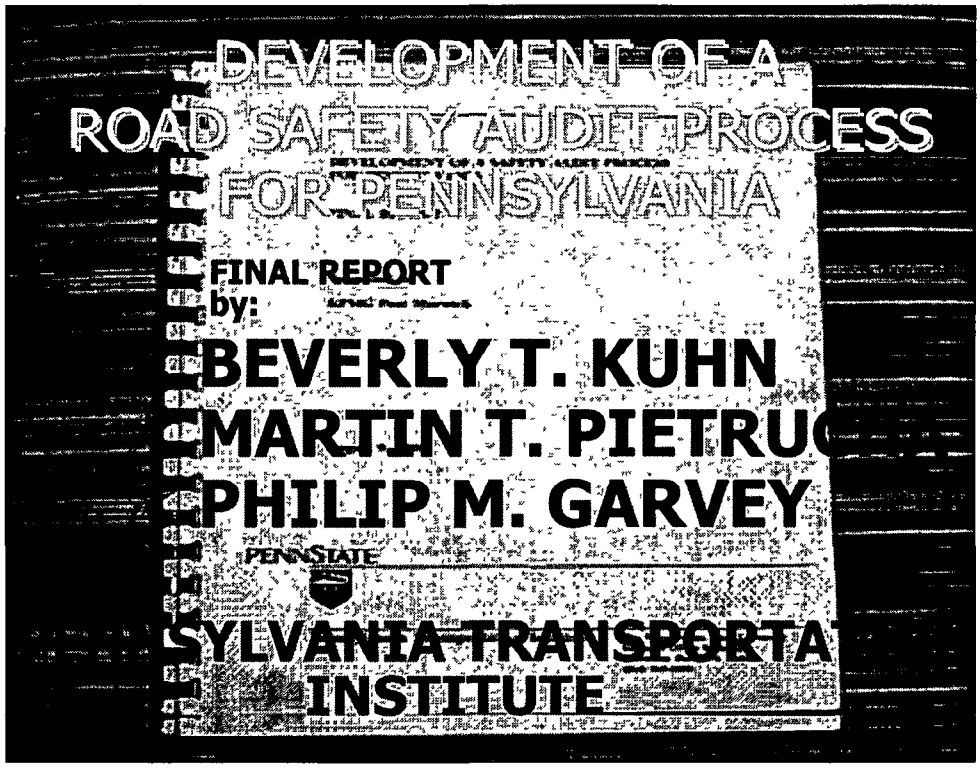
The Road Safety Audit Coordinator is The District Traffic Engineer, who is in the Maintenance Organization.



This slide shows a profile of District 10.

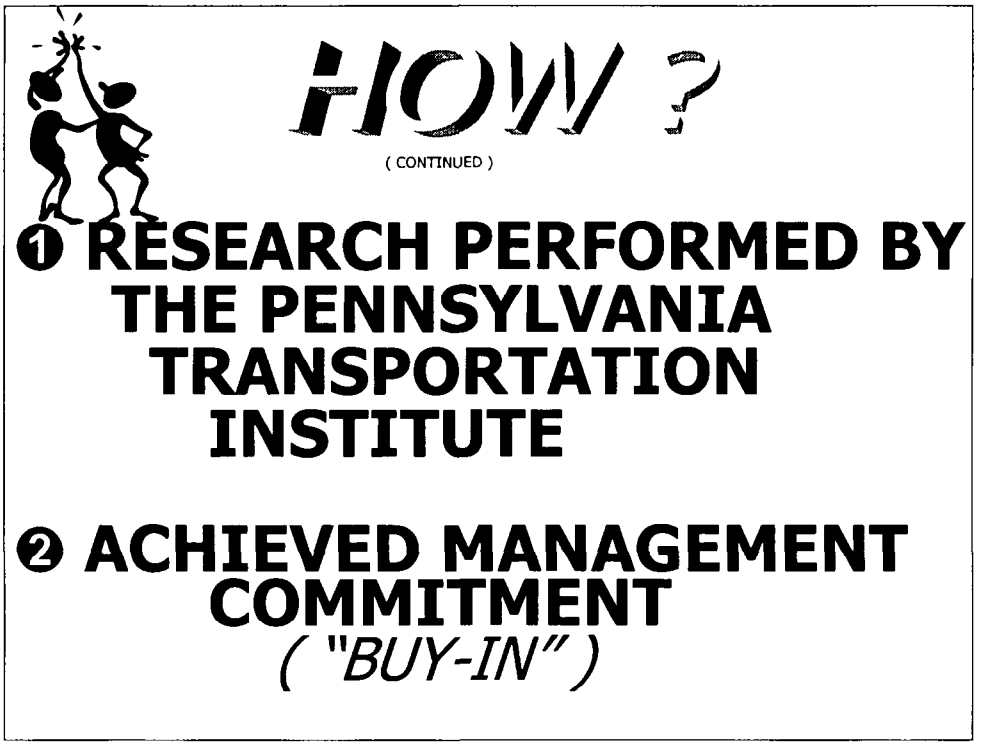
District 10 is responsible for 3201 miles of roadway, of which 283 miles are on the National Highway System.

District 10 has over 200 reconstruction projects in the design process and 5 Design Teams.



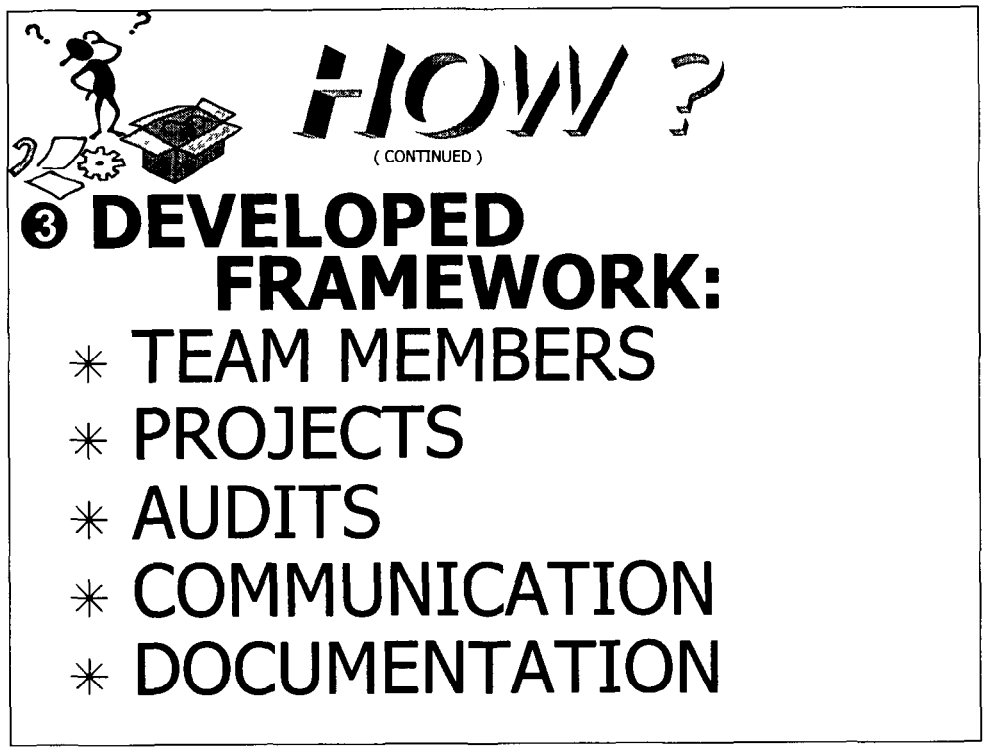
This is a photo of the Pennsylvania Transportation Institute's document that was developed to assist PennDOT in beginning implementation of Road Safety Audits..

Some of the information in this overview is adapted from this document. Most of the information is from the experiences of the pilot.

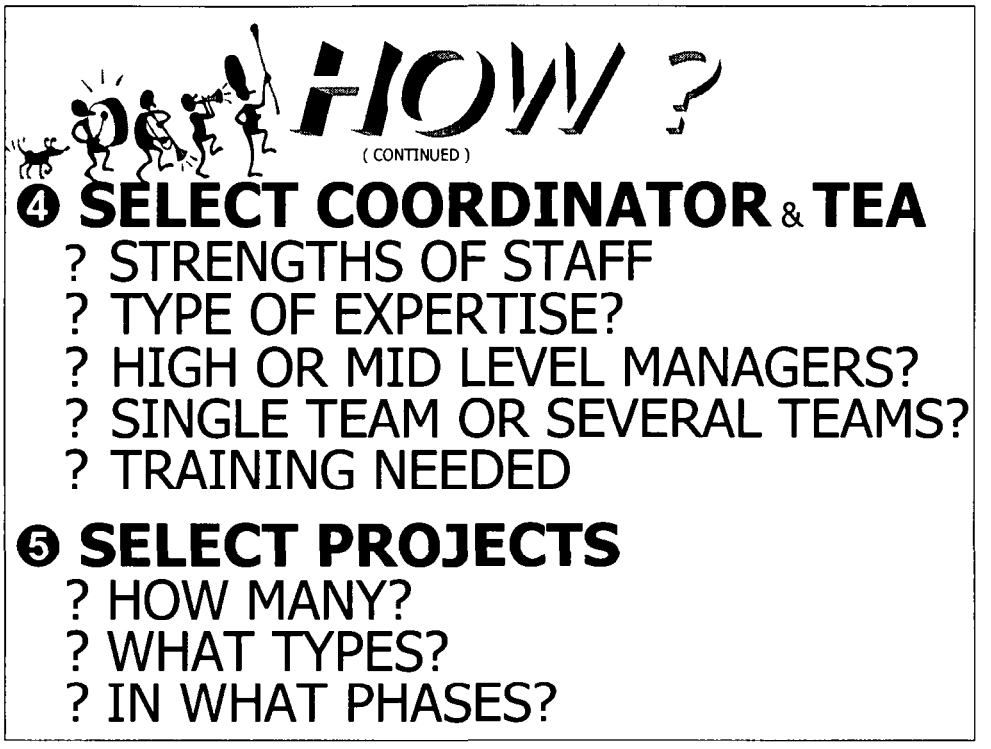


* The **Pennsylvania Transportation Institute** of the Pennsylvania State University was contracted by PennDOT to research all available information on Road Safety Audits and compile it into a document that could be used to implement a Road Safety Audit Process.

* **MANAGEMENT COMMITMENT or BUY-IN** is the first and possibly the most important step. This commitment will allow the Process to succeed by providing opportunities when time and money may be jeopardized.

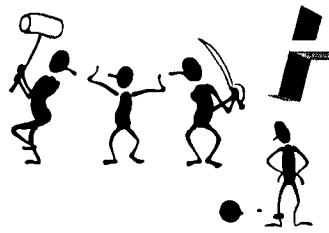


The FRAMEWORK of the typical Road Safety Audit includes these elements...



* CAREFULLY SELECT THE COORDINATOR and the AUDIT TEAM. You'll have many questions when beginning the very important first few steps. These questions will be answered later in the presentation. Experience and BUY-IN is critical. Experienced team members in the various facets of highway engineering is the most important key element in the RSA Process. The Team must be able to reach consensus, so there must be "chemistry". Also, the COORDINATOR'S role can be active or passive, but it is crucial that communication is maintained with the Design Teams throughout the projects' development.

* SELECT THE PROJECTS TO BE AUDITED. This may seem basic at first thought; however, the process can be demanding of time and effort and it may not be suitable for all types of projects. Thought must be given to this before you begin. A greater knowledge of the Road Safety Audit Process will help in this effort.



HOW ?

(CONTINUED)

⑥ DEVELOP GROUND RULES:

- ✗ WILL NOT FORCE PROCESS
- ✗ TEAM MUST REACH CONSENSUS
- ✗ NO HIDDEN AGENDAS
- ✗ ACCEPT DECISIONS OF DESIGN

The Road Safety Audit Process is a change in Project Development. Since change is not always well accepted, ground rules were developed in an attempt to limit the amount of conflict that could occur solely because it is a ***change*** in the normal procedure.

* The audits were not forced by stating harmful events and demanding actions.

* The Team did not cite concerns that were not agreed upon by all members.

* The Team did not try to use the Pilot as "a good chance to get something for the gain of few".

* The Team accepted the decisions of the Project Managers. *The District chose to use the audit process as a* ***tool****, not* ***ultimate authority*** *Some Project Managers expressed interest in ultimate authority to support issues that were deferred to money and time, however, this may have jeopardized Senior Management buy-in*

This enabled a more unbiased analysis.

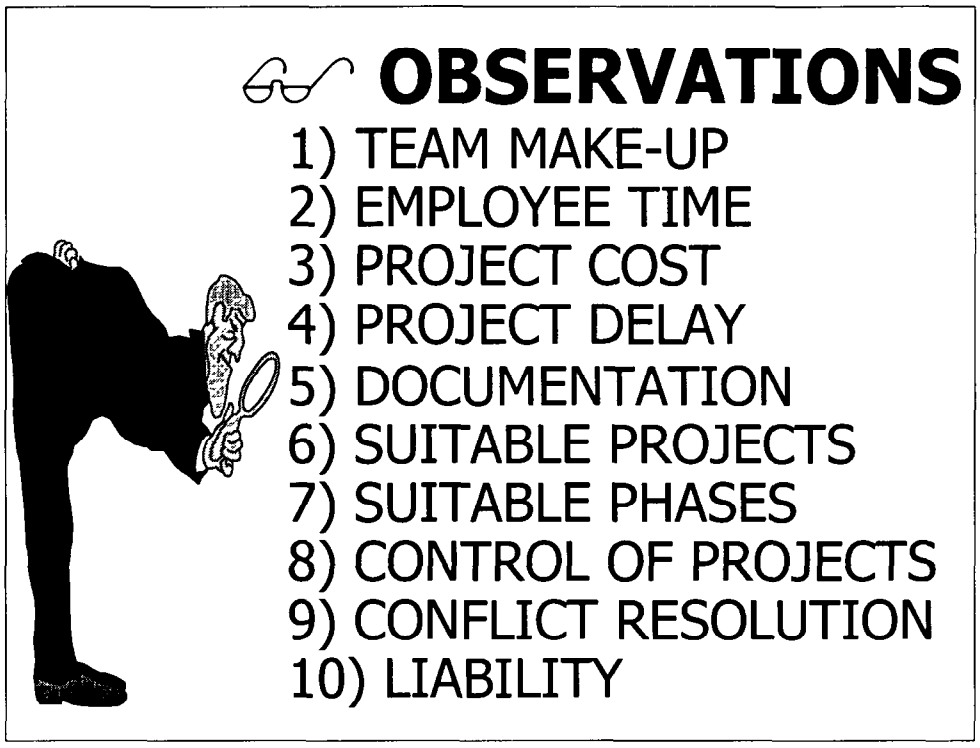
HOW ?

(CONTINUED)

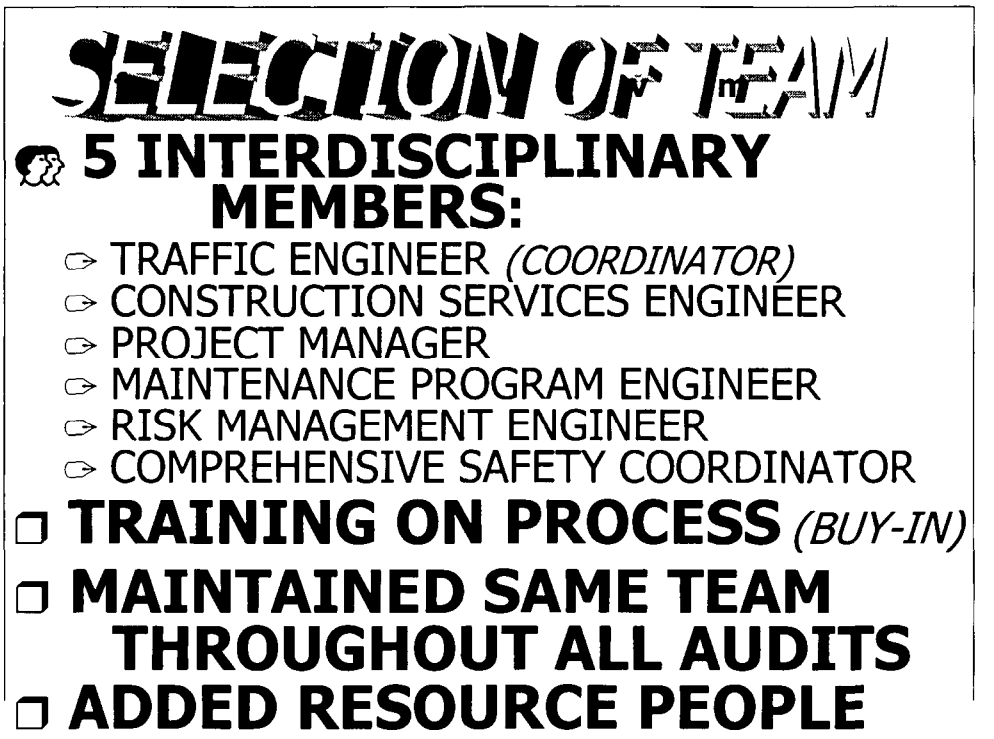
7 VARIED FRAMEWORK ; OBSERVED & DOCUMENTED

- RESULTS
- EFFECTS
- BENEFITS
- AUDIT COSTS
- PROJECT COSTS
- PROBLEMS, CHALLENGES, & OPPORTUNITIES

PennDOT's Pilot was originally hoped to be completed in a timeframe of six months. Six months was not enough time to develop a realistic view of the feasibility due to a lack of time fully conduct audits on all of the various types of projects, during each of the various phases, and continually following project development. Therefore, it was decided to utilize various methods, types, styles, etc. of each element in the framework and observe how these key issues are affected.



OBSERVATIONS were continually made and documented as variations in all aspects of the process were performed during the numerous audits. Focus was on ten key items.



These next 8 slides outline an overview of the actual Pilot Process and details the differences in the two pilot districts.

District 10 chose to select 5 interdisciplinary members as outlined:

* **The Traffic Engineer is the Coordinator and is part of the Team.** He has 18 years of experience and provides expertise in signs, signals and markings.

* The Construction Services Engineer has 30+ years of experience and provides expertise in construction and traffic engineering. **He is on the District's Administrative Staff and Program Management Committee.**

* The Project Manager has 10+ years of experience and provides expertise in Standards, Design features, AASHTO Greenbook and **Accident Reconstruction** and Traffic Engineering. She attends all the Monthly Project Management Meetings for Design.

* The Maintenance Program Engineer has 25 years of experience and **provides expertise in Maintenance, Traffic Engineering and Programming.**

*The Risk Management Engineer has 5 years of experience and provides **expertise in Tort Awareness, Traffic Engineering and Environmental Requirements.**

* The Comprehensive Safety Coordinator has 15 years of experience. She is **employed by Indiana University of PA** and works with PennDOT on **Human Factor issues and educational programs for children and the elderly.**

NOTE THE MULTIDISCIPLINARY EXPERTISE; MANY YEARS OF EXPERIENCE (+ 100years total) and ADMINISTRATIVE STAFF REPRESENTATION.

* Members were given training on the process to solicit their Buy-in.

* District 10 is maintaining the same Team throughout the Pilot.
* District 10 added resource peoples as needed.
(District 6 used separate Teams.)

THE HOLLOW BULLETS INDICATE A DIFFERENCE IN PROCEDURE BETWEEN THE TWO PILOT DISTRICTS.

This slide outlines how the projects were chosen for the Audit Process.

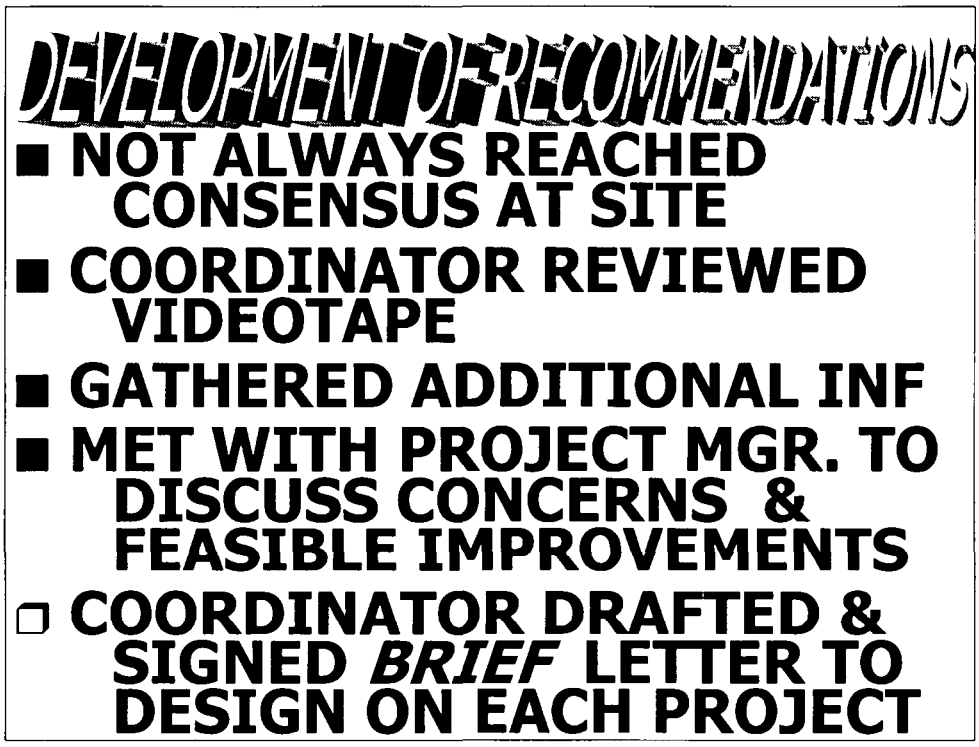
* The Team and the Assistant District Engineer for Design (2nd in command) chose the projects to be audited. The main consideration was that we select a variety of types so that a determination can be made as to the value an audit would have for each.

* 11 projects were chosen. There is no rule on how many should be audited. The more, the better. Work load and project development usually dictates.

* The various projects placed the Audits in all 5 of the stages of project development so that a determination could be made of the value in the different phases of design and/or construction.

This slide briefly outlines the CONDUCT OF THE FIELD VIEWS in District 10.

It is self-explanatory.



This slide outlines how District 10 developed the recommendations.

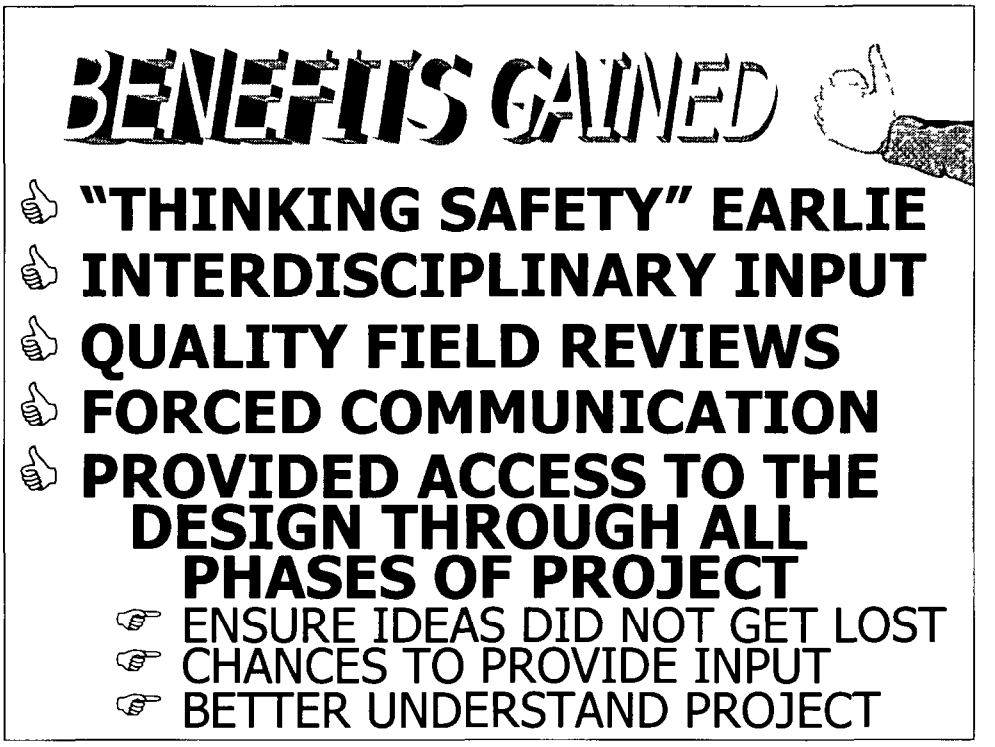
* Reaching consensus is sometimes difficult, but must be done so the "Team Effort" is emphasized.

* **Videotaping was extremely helpful for the Coordinator in capturing all discussion. It was also used to revisit certain locations.**

* Often, additional information was needed before a determination could be made. Crash data, info from other Districts, info from Manuals, recommendations from other experts, etc. were also gathered before determinations were concluded.

* After the first few audits, the Team began to meet with the Project Manager before the final recommendations were made. This allowed for dialogue which often avoided some needless work. However, dialogue was kept to a minimum to avoid becoming involved in the constraints of project development.

* **Documentation was kept to a minimum due to Tort Liability concerns. However, most research indicates that everything should be well documented.**



These are some of the BENEFITS that have surfaced from the Road Safety Audit Pilot Process, so far.

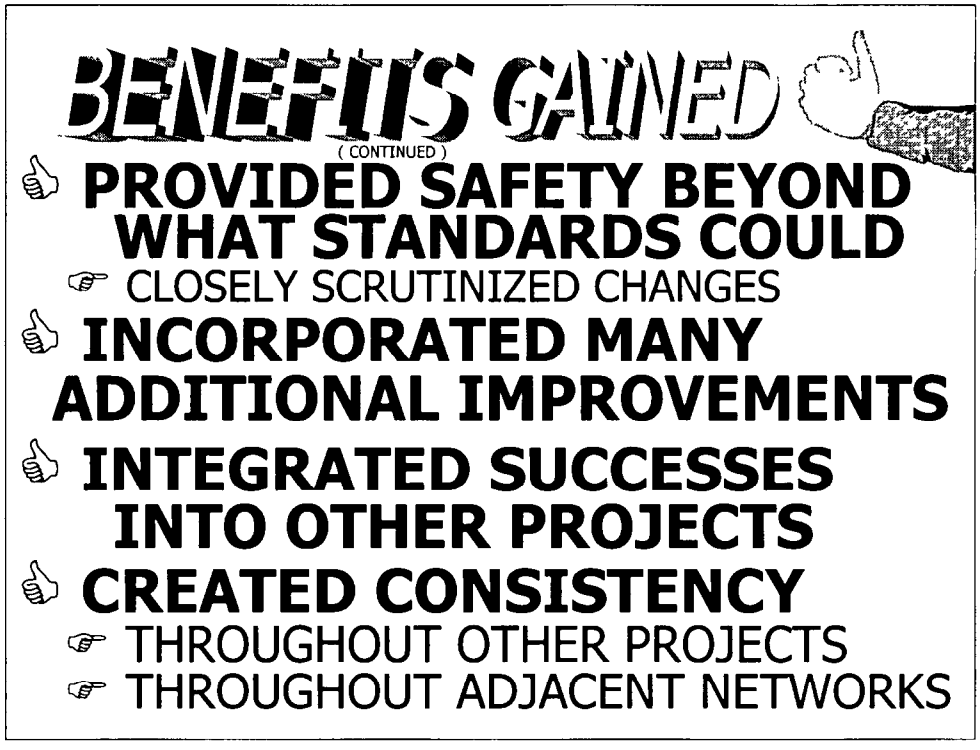
* The Audits forced the Design Team to react to safety concerns, early in the design process before non-safety related constraints, such as time and money, were established and in control of the project. It also provided input with concerns of road users not normally considered in the design of most projects. These concerns became part of the scope of work, and not an afterthought when it may be too late. Many improvements resulted from the Audits.

* The INTERDICIPLINARY INPUT is a key element in the Process and was the reason for citing many safety concerns. All Team members were instrumental. Most concerns were raised by Team Members that did not have a strong Safety background.

* A "picture is worth a thousand words!" Many concerns were cited and changes made due to having the Road Safety Audit Team actually be at the site of the project. Many concerns could have only been discerned by watching the operation of traffic and/or seeing the site. Sure, there are field views that occur throughout project development, but none that are focused purely on safety of all road users. And none that allow for citing of concerns without regard of how the concerns will be corrected.

* The Process absolutely forces communication to occur throughout the disciplines. e.g., Design learns where Maintenance problem occurs and Maintenance learns the scope of the project and has an opportunity to provide input.

* Having access to the design throughout the development of a project better ensured that safety concerns did not get lost, removed, or changed throughout the project development.



* Often standards only provide the minimum treatment required. This is often not enough, especially when considering a facility that should be compatible for trucks, emergency vehicles, and bicycles. Simply using the appropriate standard does not ensure the safest design.

* Many concerns raised resulted in numerous improvements beyond the existing scope of work. No improvement has yet been constructed and experienced traffic to determine if the improvements were cost beneficial. However, many were based on sound engineering principles and previous successes so they are sure to be beneficial.

* Successful incorporation of improvements into projects afforded the Road Safety Audit Team to then look for and integrate these into the project development of other projects even without a formal Audit.

* Consistency was created in many areas because the formal report is circulated throughout the Agency which educates others responsible for similar designs. It also creates consistency by the Team ensuring that applicable standards are being used and by the Team considering adjacent networks when reviewing a section of roadway.

* Through brainstorming and achieving consensus among a team of experts on many safety related concerns, the Pilot Team Members gained individual knowledge of the other disciplines. Information gained at every Audit can be consistently applied to other Audits and day to day duties. The Pilot Team also had the opportunity to perform an Audit with representatives of the Federal Highway Administration that provided valuable geometric design expertise that was obtained through experience with other State Agencies. Every Audit conducted better prepared the Team for the next one and educated each other.

* The Design Teams experience a higher level of comfort through knowing that their project(s) has been scrutinized by others so that they can be better assured that their product is of the highest quality possible and will serve all road users.

* The Team was called upon for review of specific features with which the Design Team was struggling. This served to assist the Design Team and it served to encourage and build confidence in the Road Safety Audit Team.

* One of the Core Values of the Malcolm Baldrige Quality Assessment is "**QUALITY THROUGH PREVENTION**". The Road Safety Audit Process inherently incorporates this core value into the design of the project by ensuring that quality is maintained by **preventing** some common occurrences. This is described in more detail next.

The Road Safety Audit Process inherently incorporates *"Quality through Prevention"*, a core value of the Malcolm Baldrige Quality Assessment, by ensuring that quality is maintained by preventing some common occurrences:

* Undesirable effects of motorists which can create potential safety concerns and costly changes in the future.

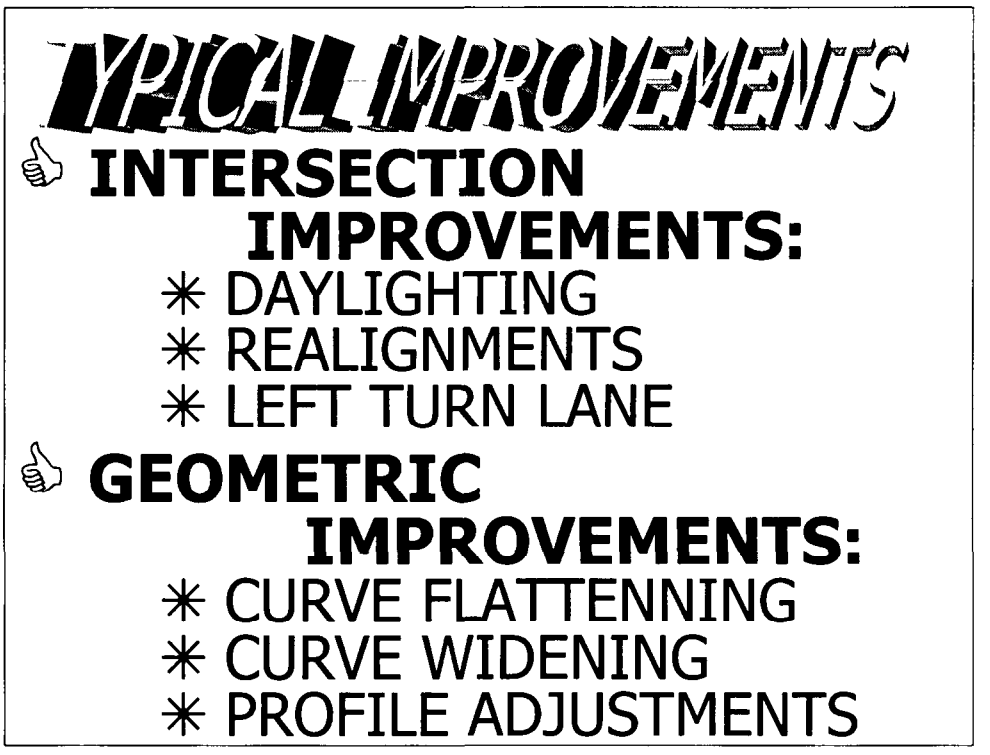
* Certain standards or combination of standards may be inappropriate or unnecessary and can create potential safety concerns or detract from a more viable improvement.

* Changes to design features made during value engineering reviews and/or construction may create safety concerns. A timely audit can ensure these occurrences are not unwary, unnoticed, or unchallenged. For example, drainage features are often compromised due to the high costs that can be saved. Drainage is one of the most important safety items in a construction project and it can also be the most expensive to correct after the fact. An improvement may cost a lot; but it will cost much more if you must retrofit later. It may be an inferior product, also.

* Opportunities to enhance safety are maximized to make needed safety improvements. Take advantage of the often "few and far between" reconstruction projects. Now is the opportunity to make needed improvements and prevent issues from reoccurring.

* Several occurrences of missed opportunities to enhance safety on recently constructed projects would been raised had those projects been audited.

DON'T MISS THE BOAT!



These are TYPICAL IMPROVEMENTS that have resulted from the Pilot, so far.

* INTERSECTION IMPROVEMENTS were the most drastic type of improvements resulting from the Road Safety Audit Process. These included improvements such as removing earth banks (daylighting) to improve the available corner sight distance and adding left turn lanes to reduce the number of stopped vehicles. More complicated improvements were also successfully incorporated, such as completely redesigning the vertical and horizontal alignment to improve the vehicular movement conflicts. An interchange was also redesigned to eliminate left turn movements and allow for more driver friendly and safer right turn movements.

* GEOMETRIC IMPROVEMENT (horizontal and vertical alignment) needs were also discerned through field reviews. Many opportunities exist for curve flattening, curve widening, and profile adjustments

These are TYPICAL IMPROVEMENTS that have resulted from the Pilot:

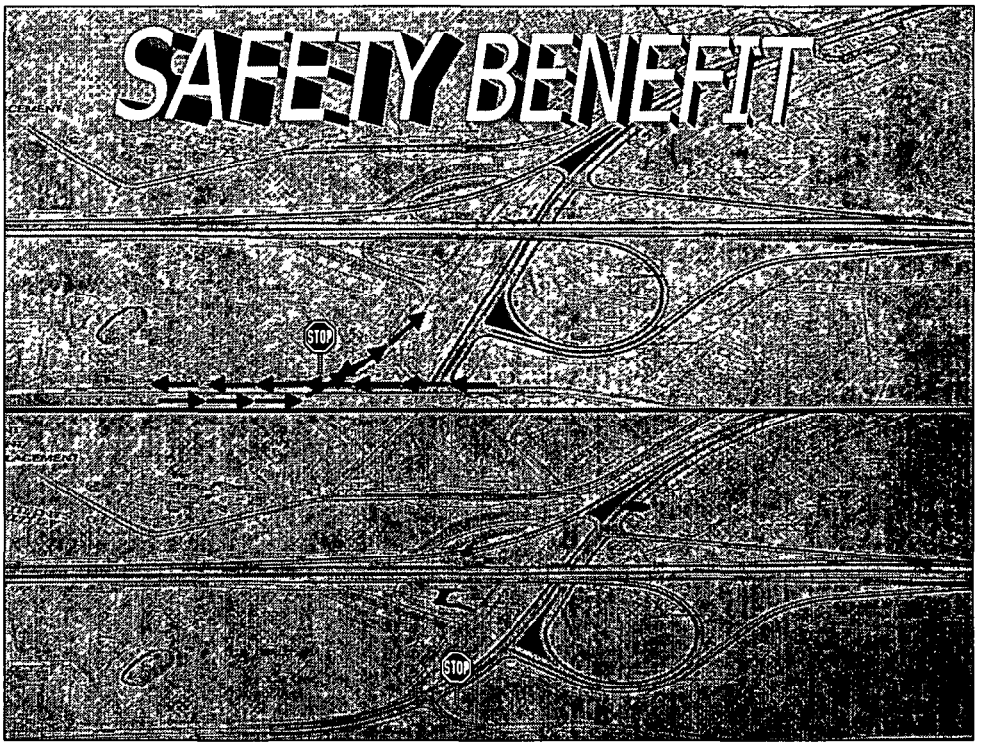
* UTILITY IMPROVEMENT needs are very common concerns that arise from Audits. Focus is always on attempting to remove, relocate, or combine the above ground utilities that could pose as potential fixed object hazards. The Road Safety Audit Team attempts to identify areas that may potentially experience an undesirable increase in vehicular speeds and does not focus on existing crash locations. (*This is done through other means*) **This potential is best determined through field reviews.**

* FIXED OBJECT REMOVAL is another area that arises on most Audits in the Pilot Districts. As with above ground utilities, the Team identifies through field reviews, areas that may potentially experience an undesirable increase in vehicular speeds and does not focus on crash locations.

* ACCESS MANAGEMENT improvements, such as relocating/removing/eliminating driveways can be very unfavorable to the affected property owners. These types of improvements can be successfully incorporated; but not without a considerable amount of effort from the Design Team and others.

* Two projects successfully incorporated a paved and protected area to the side of the roadway that will be utilized for weight, inspection, and speed enforcement.

* Other improvements, particularly for bicycles and pedestrians were also made. They mostly relate to improving roadside barriers to enhance their safety

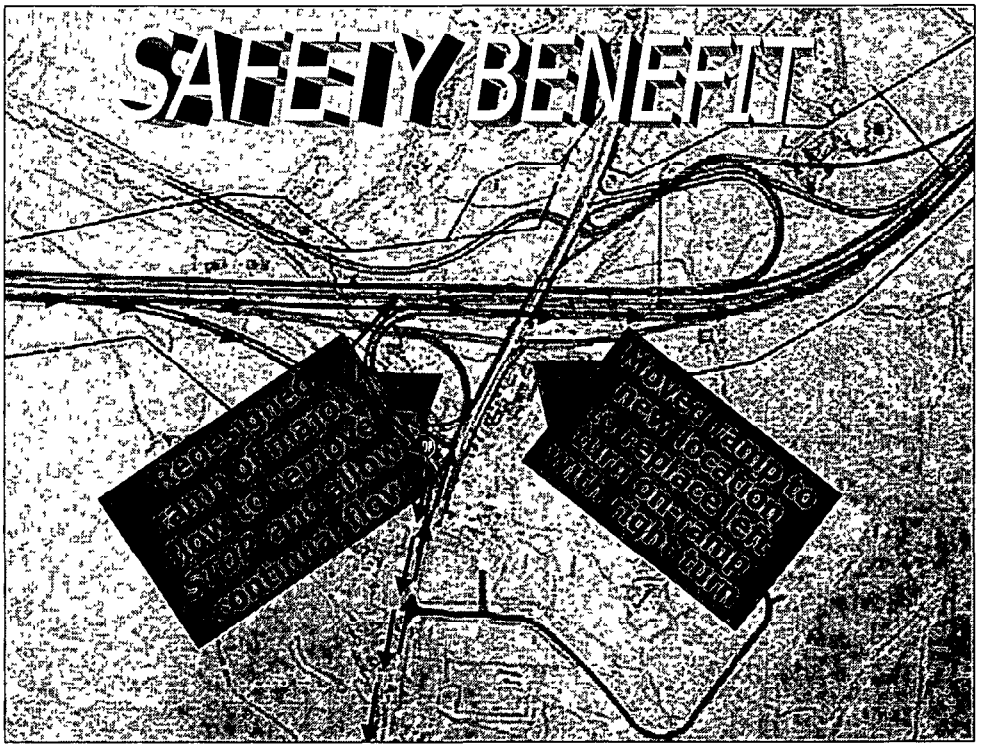


This is a safety improvement redesign that was incorporated into a capital improvement project in Indiana County.

* The existing intersection is shown in black with the new construction intersection design shown in color. The new construction is basically a reconstruction of the original T intersection with a removal of a building which is in between the legs of the T.

The Safety Audit Team reviewed the operation of the intersection where the major traffic movement is not along the long leg of the T, but must wait for clearance from approaching traffic and turn left. Also, a crash history was present involving the same movement.

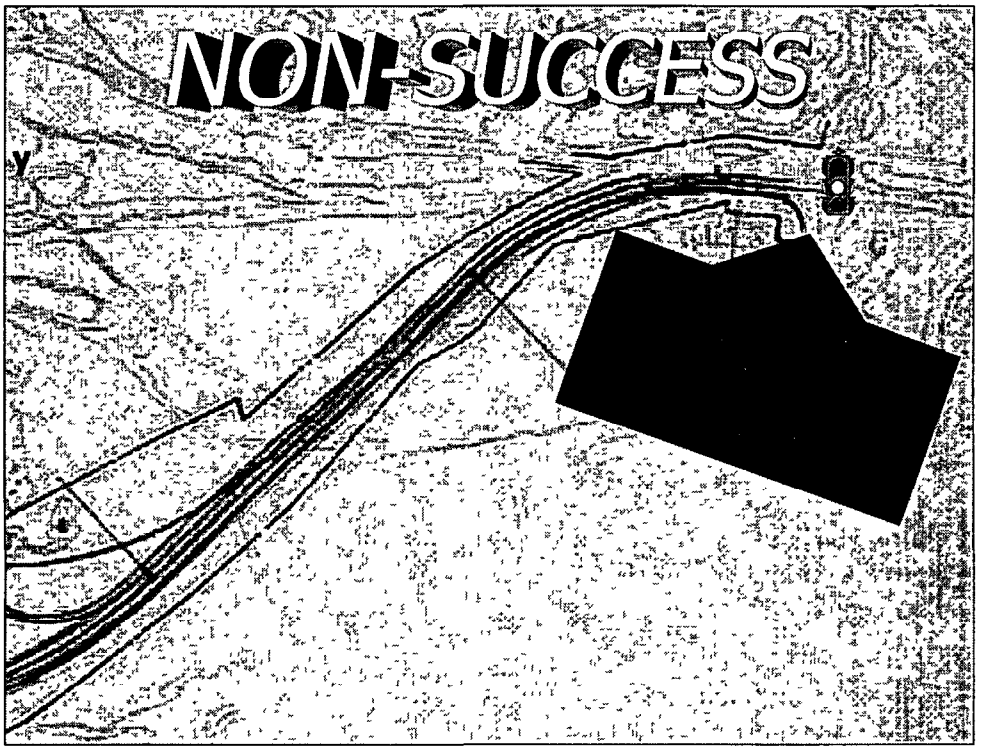
* The recommendation to redesign the intersection was analyzed and designed by the Department's Consultant and incorporated into the design to support the major movement as the through movement by flattening the curve, realigning the opposing leg, and even adding a southbound left turn lane since traffic speeds may increase.



This is an example of a project that as a result of the Audit in the Preliminary Design Phase of a Capital Improvement Project (By-Pass Construction), several improvements were incorporated into the design.

* This shows an interchange design on a Capital Improvement Project where the Eastbound off-ramp of a US route was designed with a STOP condition to continue along the route. The RSA Team noted that this STOP condition was not efficient and had the potential for rearend crashes. After many hours of redesigns and meetings, the Design Team incorporated a redesign of the ramp so traffic to remain on the route will not stop.

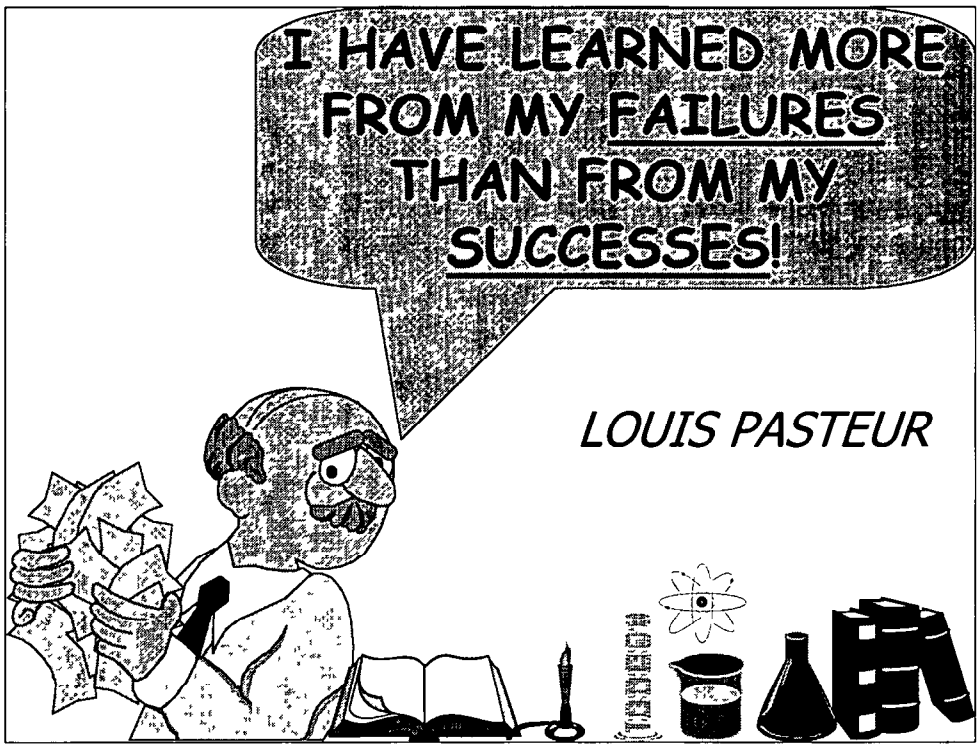
* Also incorporated, was a move of another ramp that will eliminate left turns to enter onto the other PA route and instead will be making a safer right turn.



This is an example of a "NON-SUCCESS" on the very same project.

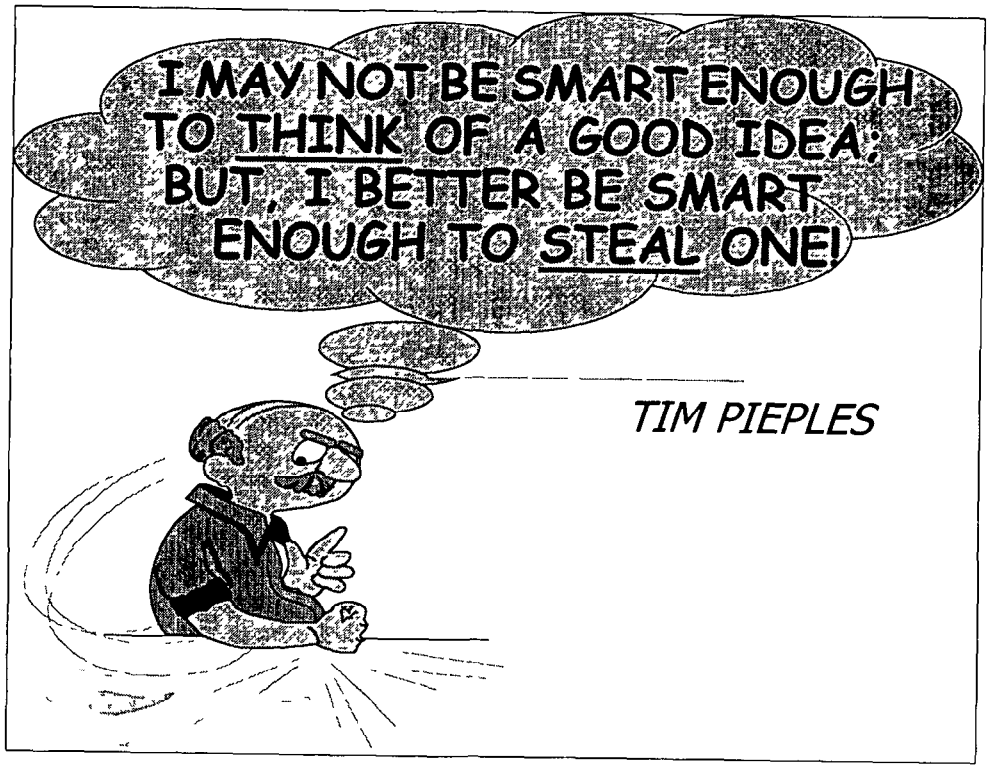
The requested improvement of replacing an at grade intersection with an interchange would have required going outside the APPROVED Environmental Footprint and would have jeopardized the project completion. HOWEVER, other measures were taken to address the problems associated with the intersection and the District will reconsider the request at a later date.

This is a good example of why the Team should raise CONCERNS and not tie the hands of the Design Team with <u>specific</u> improvements! There may be numerous ways to improve a problem.



This quote from Louis Pasteur is appropriate when concerns raised are not incorporated. A valuable asset of the Road Safety Audit Process is that experienced gained on a project, even through a non-success, can be translated to another project where existing conditions may permit incorporation. **It is a process that builds and integrates success.**

DISTRICT 10 has been successful in approximately 50% of the attempts to improve particular situations. Most of the reasons stem from late changes being very difficult to incorporate and still remain ON BUDGET AND ON TIME. However, most of the remaining 50% will be valuable for future projects. Also, the Pilot varied the types of projects and phases of projects to evaluate the differences; therefore, some were at a disadvantage from the start.



GOOD IDEAS BECOME CONSISTENT. We should always learn from our trials and errors.

COSTS

AFTER ONE YEAR

$ 10 FULL DAYS FOR FIELD VIEWS

10 days x 7 hrs. x 5 people = 350 hours
TOTAL = 350 hrs. x $50/hr. = $17,500

$ COORDINATOR'S EFFORTS

ARRANGING FIELD VIEWS = 4 hrs.
DOWNLOADING FIELD NOTES = 30 hrs.
ATTENDING DEBRIEFING MEETINGS = 8 hrs
TOTAL = 42 hrs. x $50/hr. = $2,100

$ REDESIGNING EFFORTS

SURVEY, CADD, CLERICAL
WAG of 300 hrs. x $40/hr. = $12,000

$ TOTAL COST = $31,600

These are the very roughly estimated salary costs for the District staff of the time spent in performing Road Safety Audit functions after one year. This is very little for the amount of success achieved. Most of the time and efforts were placed on a select few projects.

It is estimated that the average salary cost of an Audit would be $2,000 to $5,000.

Naturally, added improvements have added a great deal of costs to the project development; however, this is not considered as a cost of the audit.

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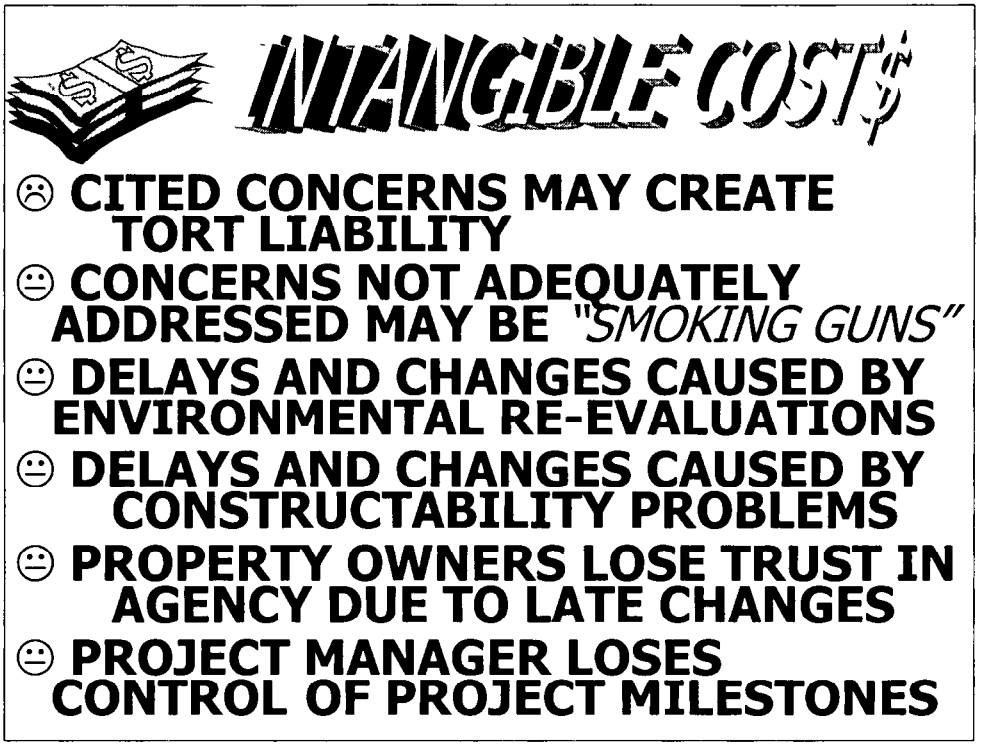


The Pilot had costs that cannot have a price tag placed on them. They are costs that an Agency must realize that they may experience; however, they are not insurmountable and can be minimized if an Agency is aware of their possibility.

* Any concern that is cited may raise an issue in a law suit that may not have been raised if it had not been not cited by the Agency itself.

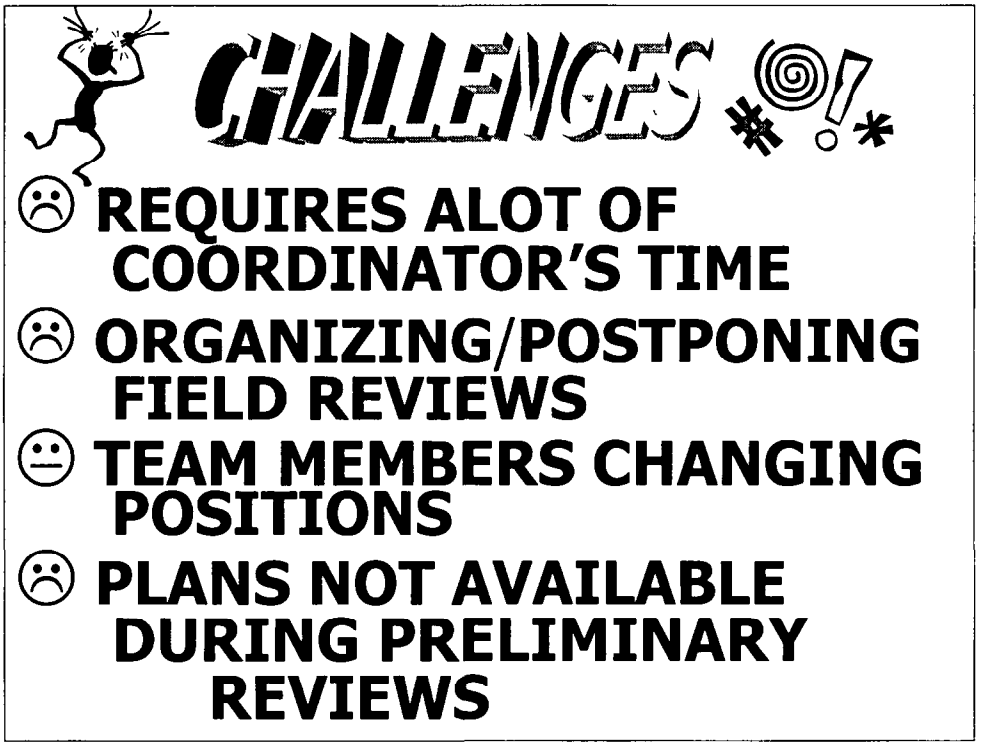
* Concerns that are **not** addressed may be a considered a tort liability if it gets to the attention of a party in a future law suit.

* Delays are inevitable. The key is to start early enough so it minimizes associated problems, such as letting dates and commitments.

* Sometimes the Team has good ideas, but no one can figure out how to correct it within the existing constraints.

* Property owners may have been told something previously and the Road Safety Audit Team creates a change in the design that changes the Agency's position. This creates a distrust. Property owners do not appreciate nor understand that changes in design do occur, let alone ones that affect them personally.

* Re-designs can cause Project Managers (Owners) to get the timing of the projects' milestones off track. This could adversely affect other projects.



This slide states some CHALLENGES (problems) that have been experienced:

* As the Coordinator goes, so goes the Safety Audit Reviews. An aggressive Coordinator will find a way to be successful, and vise versa. The Audits do not move unless someone takes the lead. Much time is needed (hopefully, AT FIRST) to become familiar with the procedure.

* High level managers have busy schedules that are constantly changing: often by others and beyond their control. This caused frustration, because it was initially determined that all field reviews would have all Team Members present.

* The District has had numerous position changes during the Pilot timeframe; many involved Team Members. As a Member moved to a new position he/she was dismissed from the Team. This required catching-up for the replacement and a loss of Audit experience for the Team.

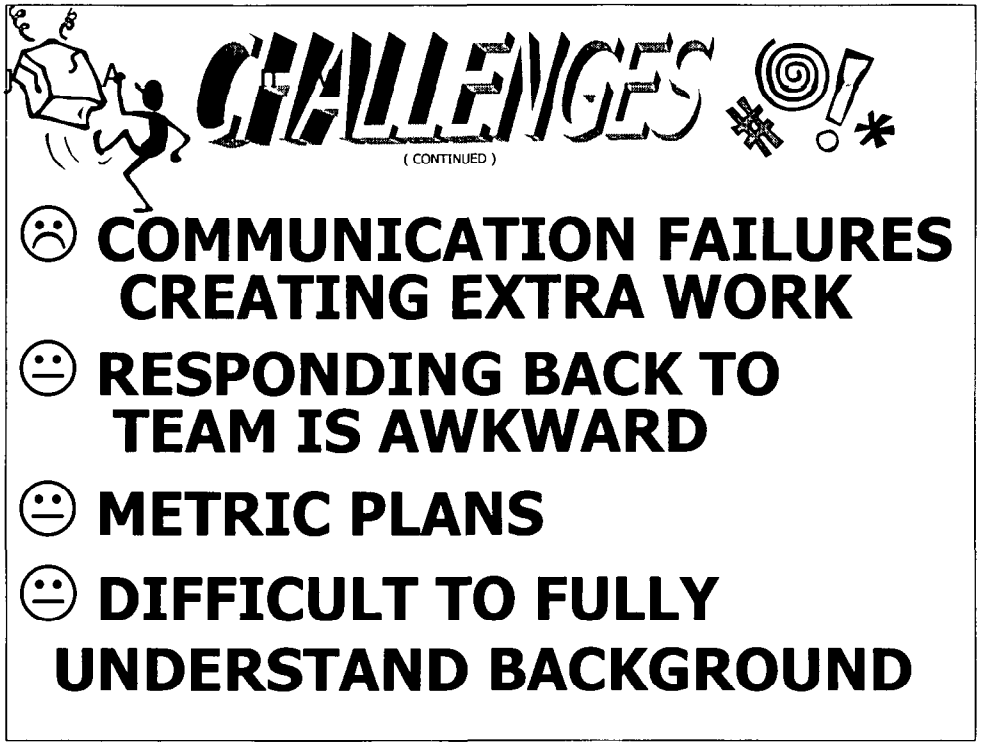
* Reviews should be held early. Usually no plans exist early in project development. This makes decisions difficult because some features and design decisions have not yet been made. This requires the Coordinator to keep track of numerous options, possibilities, and directions which is extremely frustrating.

This slide states some additional CHALLENGES that have been experienced:

* There is a very short window of opportunity when change is easy. When the **initial** review is during a later phase, difficulties with design changes occurred and selling became more difficult. The Pilot eliminated reviews during later phases when there was no initial review early in the project development phase.

*On the Capital Improvement Projects where there were needed environmental approvals, many concerns cited affected the approval and required changes. This created conflicts that needed resolved.

* The Coordinator will spend a lot of time determining the best way to state concerns due to fear of tort liability. The Project Owner has even a more difficult time with the response due to a slowly evolving process that does not always get issues resolved in a timely manner. This makes drafting a letter that needs to address many concerns difficult. Most responses had to be requested by the Coordinator numerous times before received. In fact, a couple issues that were not accepted due to environmental issues were later accepted and resolved after the response was drafted. This creates a lot of paper work and tracking.



This slide states some additional CHALLENGES that have been experienced.

* A lot of wheel spinning can unnecessarily occur if communication does not occur accurately and in a timely fashion. A project had a major down scoping occur for fiscal reasons, i.e., from a Betterment Project (major reconstruction) type to a Surface Improvement Project (1 1/2 " of bituminous ONLY) without the knowledge of the Coordinator. Because the Coordinator was unaware of this change, an unnecessary/futile field review occurred. In another project, the Coordinator also performed research unnecessarily to sell a concern when the change was already accepted but was unaware.

* Project Managers constantly needed reminded hat a Formal Report back to the Coordinator is required. It was not because they were skirting issues. It was very difficult to determine **when** the report should be written. This was due to the dynamic process that does not occur at the same pace for the numerous and various concerns. Some are resolved quickly, some are resolved slowly, some cannot be resolved. There never really is a convenient nor ideal time to respond and be assured that addendums will not be needed and tort liability is not created.

* Metric Plans! Pennsylvania is relatively new to metrication. Although most Designers/Project Owners are familiar with the conversion, many other disciplines are not yet familiar with Metric which caused a lot of frustration and difficulty to compare design standards to field conditions. We believe many things were inadvertently overlooked due to unfamiliarity.

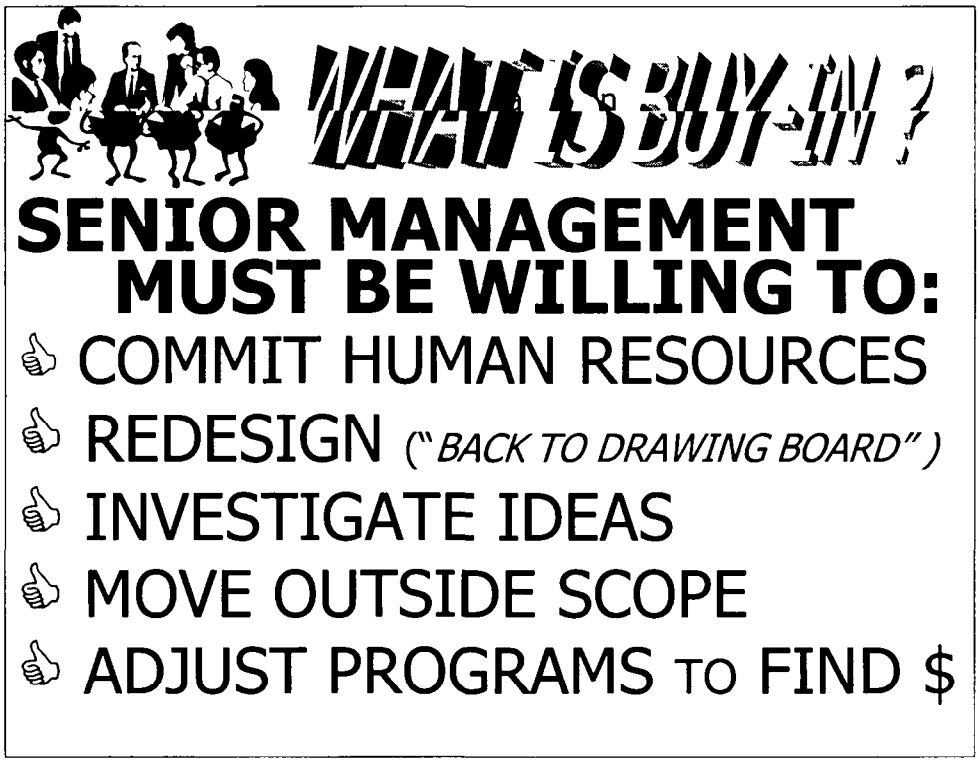
* It was difficult to fully understand the project during the short time that an audit takes place. Often issues were already considered somewhere during project development as those responsible have already been wrestling with the project for some time. Not having the full background often created conflicts that needed resolved before moving on.

This slide states some additional CHALLENGES that have been experienced.

* Every project has unique road users and Stakeholders. It is extremely difficult to gain input from all concerned without having a representative from all interest groups becoming involved in the Design Process. Although PennDOT and other Agencies are including Community Advisory Committees to gather concerns in selected projects, the enormous amount of time it requires to do this makes it impractical for all Road Safety Audits. Therefore, Team Members have to act in the interest of all road users through their experience and acquiring other knowledgeable Agency and non-Agency, as practical.

* BUY-IN was very difficult to maintain when sensitive issues were raised and scrutinized after having project team members previously making a decision and moving forward with the design which was counter to the Road Safety Audit Team. Even though some decisions landed identically as designed, some members of the Design Team(even top management) saw the Safety Audit as going backwards and not forward.

* At times, the same constraints that the Design Teams experience were experienced by the Safety Audit Team, such as time and money. At times, the possibility of delaying the project created a lack of "total" cooperation to incorporate redesigns. Since the Audits were not forced, many improvements were not carried through to the end.



This slide explains the meaning of BUY-IN as it is related to the Road Safety Audit Process.

BUY-IN is a must so that everyone understands the Process.

BUY-IN helps accept the inevitable.....MORE WORK! AND OCCASSIONAL NON-SUCCESS!

Senior Management must realize and accept the following:

* Commit the human resources needed to perform such an important task.

* Issues may be revisited. A fresh look is often needed, especially if the issue affected others throughout project development. Take the time now to prevent more time and more money to be spent later.

* You must be willing to get out of the "Comfort Zone" and try and learn from new ideas.

* Sometimes, the scope needs changed so hat the project can truly be a multi-modal improvement project that will serve and benefit all road users for many years. This is not always the focus when a project is first programmed.

* New ideas, new issues, new work brings the need for unanticipated money. Other projects may need adjusted so that an issue can be addressed. This shows a commitment to safety.

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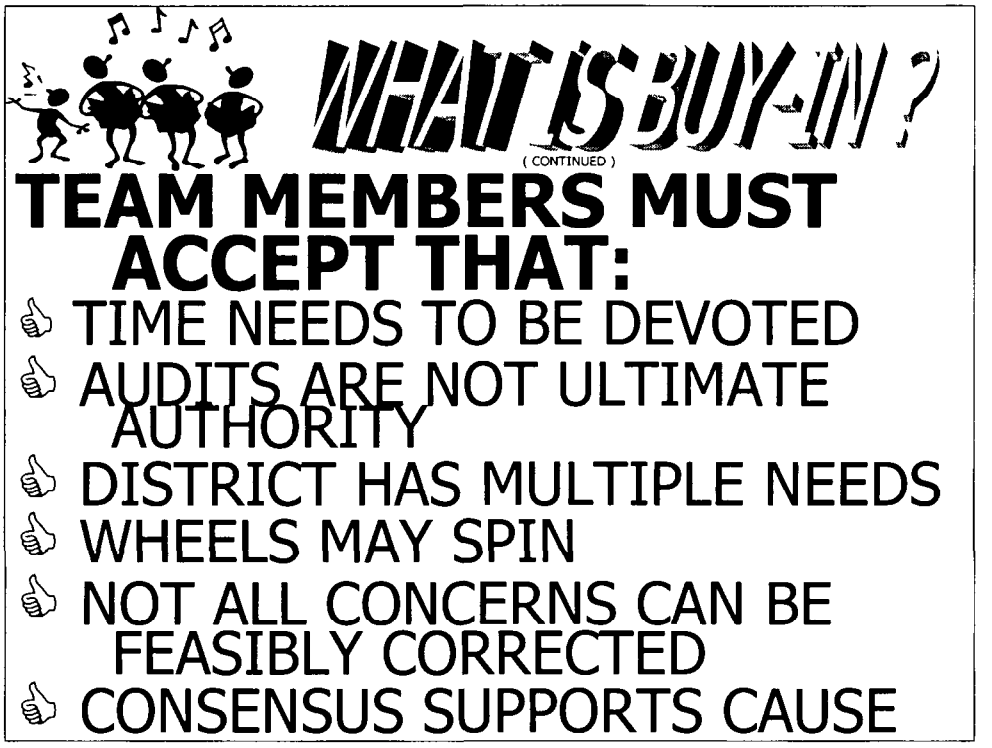

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The Road Safety Audit Team Members must realize and accept the following:

* Time will be needed---1-2 days per month

* Audits will not be forced and are to be used as an **additional tool** to determine needed project improvements.

* The District has multiple needs and costly issue may have far reaching repercussions throughout the District. One must keep the more wide range vision.

* Wheels may spin and issues may be revisited. Again, a wider vision will help accept that sometimes issues are more complicated than just changing a design.

* Not all of the concerns cited can be adequately addressed in a reconstruction project within prudent constraints. However, raising the concern will "open the door" for other possibilities. Some concerns are too complex or beyond expectations of a reconstruction project to solve.

* Team Consensus is needed to demonstrate a true need and not one that is self-serving. The Team needs to be able to reach a common ground before they should expect an Agency to react.

These next slides contain OBSERVATIONS that were directly made, told to be factual, or deduced from the experiences and results obtained from varying the method of performing the numerous facets of the Road Safety Audit Process.

This slide addresses TEAM MAKE-UP. The Team Make-Up is an extremely important decision that can make or break success.

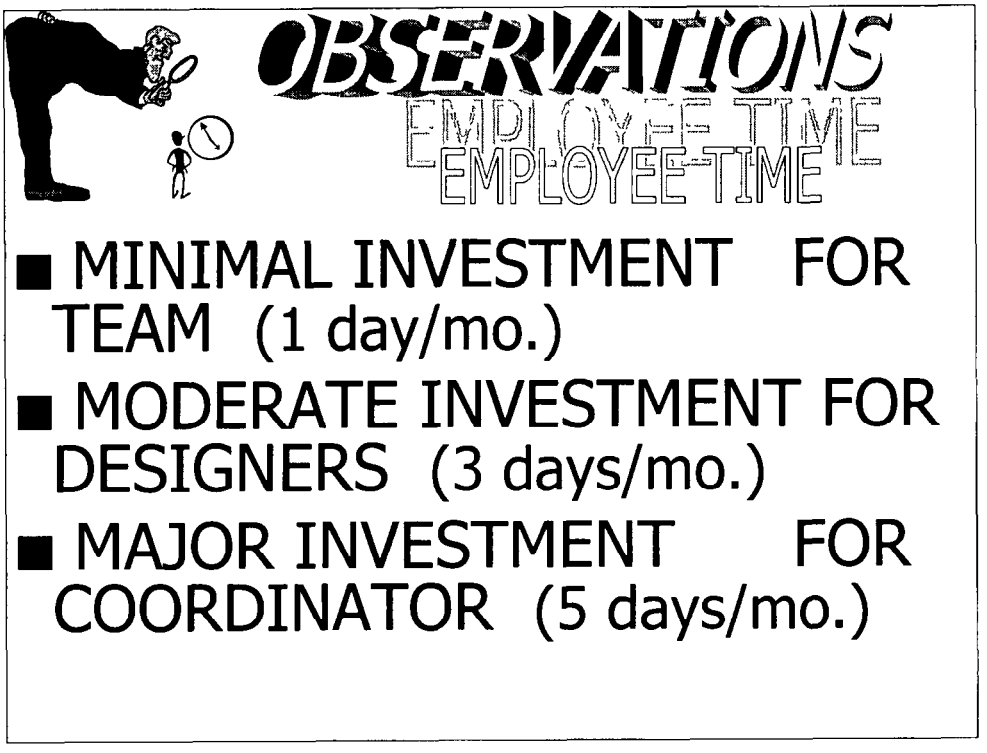
* The entire Team must thoroughly understand the Audit Process and accept the bad with the good. Understanding the process is necessary so the field reviews will remain productive and the concerns that are being raised are reasonable and prudent. BUY-IN is described in more detail later in the presentation.

* Safety knowledge is a **must** in the make-up of the Team. Understanding how the AASHTO Roadside Design Guide, Positive Guidance techniques, and how/why crashes occur is key in determining potential problems with a design. Knowledge of current STANDARDS and GEOMETRIC DESIGN practices assists in determining the minimum requirements and the safety associated with the various design features. HUMAN FACTORS play a major role in highway safety and greatly assists in presenting problems and concerns, also. **Provide training if an expertise is not inherent, whenever possible.** The Road Safety Audit Process needs a person that fully understands and embraces the process. When the Coordinator is inactive, so is the Team. An aggressive Coordinator can greatly help in monitoring recommendations and staying in constant contact with the Design Teams.

* Having at least one HIGH LEVEL MANAGER assists in maintaining credibility by adding well-rounded knowledge of the Agency and, therefore, helped determine what may be feasible and what may not.

* Maintaining the same Team throughout the Process builds expertise and provides consistency from project to project Especially important in some of the skills not inherent in many Agencies, i.e. Human Factors, Accident Reconstruction, etc. Although, various Teams will help manage limited human resources.

* The Pilot utilized from 4 to 15 members. More than five members made obtaining consensus and keeping a focused audit challenging and difficult.



This slide outlines the observation made with regard to EMPLOYEE TIME.

* The TEAM meets when reviews are scheduled. This is approximately 1 day per month.

* The DESIGN TEAM will need time for the following:

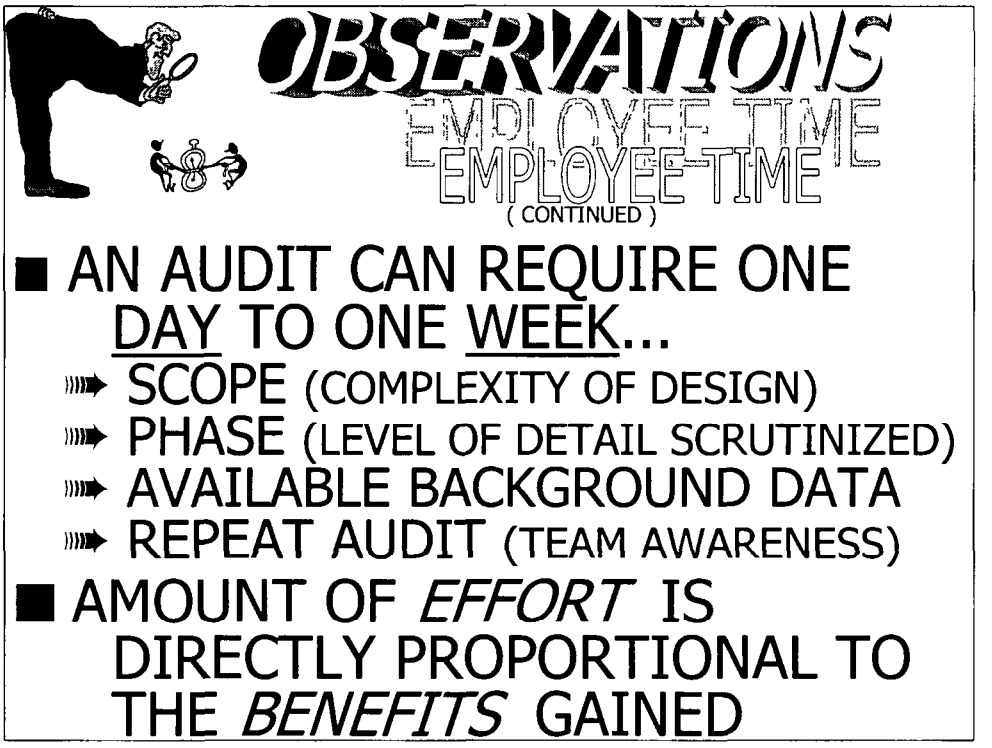
Prepare briefings
Attend a field view
Search for solutions to concerns
Redesigning features
Contacting property owners
Resubmitting for approvals
Communicating with the RSA Coordinator and Program Management Committee

This is approximately 3 days per month. But it will involve only those Design Teams that have a project subjected to a Road Safety Audit.

* The COORDINATOR will need time for the following **for each project**:

Arranging meetings/ field reviews
Analyzing field notes
Processing reports
Communicating with Designers
Researching possible solutions to concerns

This is approximately 5 days per month.



* A single Audit can require anywhere from one day to one week.

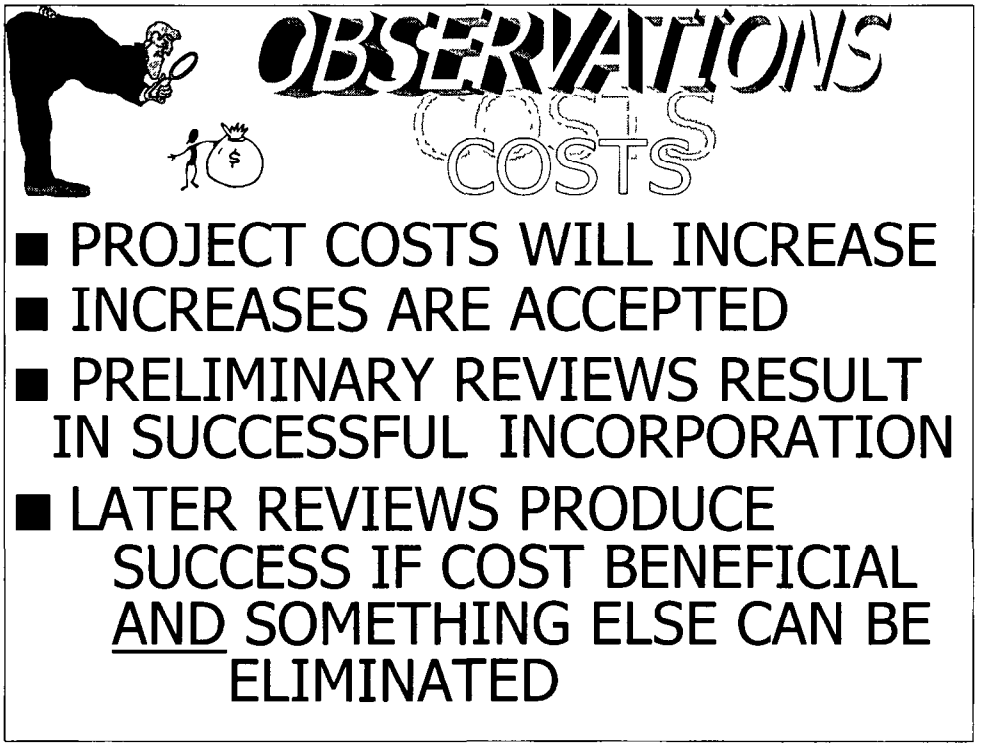
  * They will be dependent on the SCOPE OF WORK or the complexity of the project. Some simple designs can be understood and reviewed very easily. Others need additional data to be collected and may require several meetings.

  * The PHASE of the project will dictate the design features that will be scrutinized. Some are simple,some are complex.

  *The amount of AVAILABLE BCKGROUND DATA is directly proportional to the comfort and ability of the Team to satisfactorily scrutinize the design.

  * If the Audit is a REPEAT AUDIT, the Team has already become familiar with the details and can review features more quickly. Also, as the Design progresses the level of detail scrutinized by an Audit is usually lessened and the Audit Team receives more of the normal constraints received in Project Development, which makes the Audit be completed more quickly.

* A cursory review will usually result in identifying a fewer number of concerns. The more time and attention to details given to the plan and field reviews, the greater the number of safety concerns that are identified. Time and effort is directly proportional to the quality of the audit. The more time and effort that the Team puts forth, the better the results. Therefore, if the Team has early successes, the Team will probably put forth more effort and vice versa. It's human nature. If the Team is given projects that are destined for failure, i.e., too late in the design process or already over budget, or if their concerns are not taken seriously, there is a good chance that the next Audits will be less thorough. It's human nature.



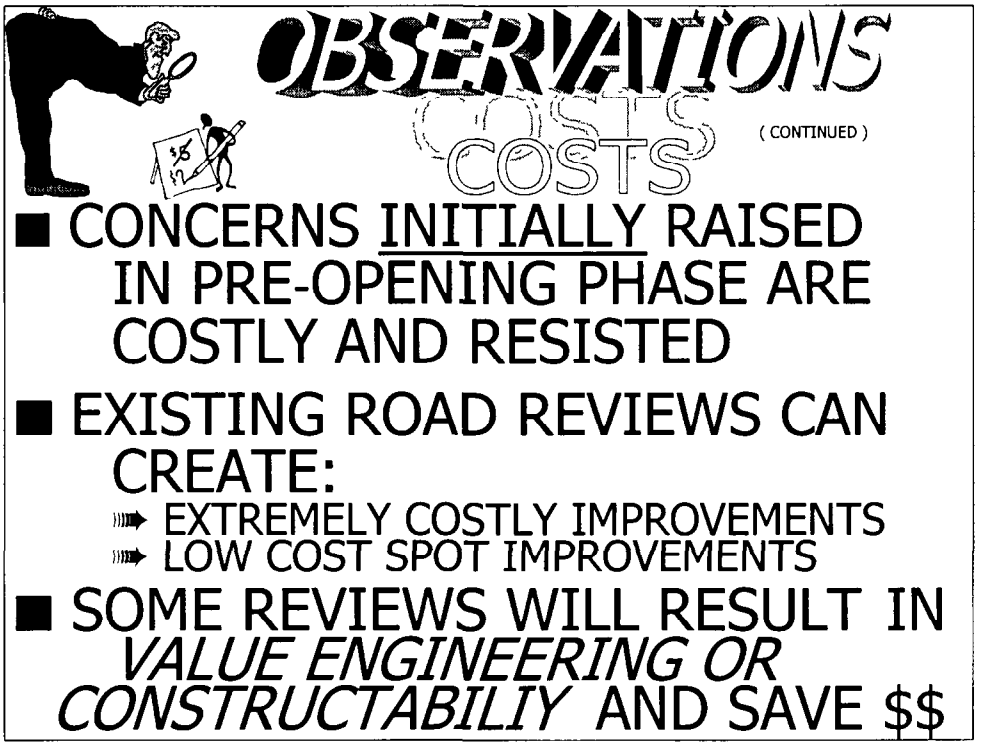
This slide addresses COSTS.

* Most of the improvement incorporated into projects resulting from Road Safety Audit Reviews involved extra work and resulted in additional costs.

* Additional costs was never an issue in rejecting an improvement. The costs associated with safety concerns were always accepted. No one argues with a "TEAM OF EXPERTS". Costs may have been a reason for not incorporating an improvement if the recommendations that were cited were way beyond the scope of the project. However, the Team always considered the scope of the project in citing concerns. (DELAY seems to be more of a constraint.)

* Most concerns cited in PRELIMINARY ENGINEERING phases were addressed.

* Reviews made in the later phases of projects (beyond mid point of Final Design) require cost beneficial improvements to be incorporated. That is, the recommendations that result from the cited concerns are scrutinized more closely. If there is more than one way to address a concern, the cheapest way will be selected at this point.

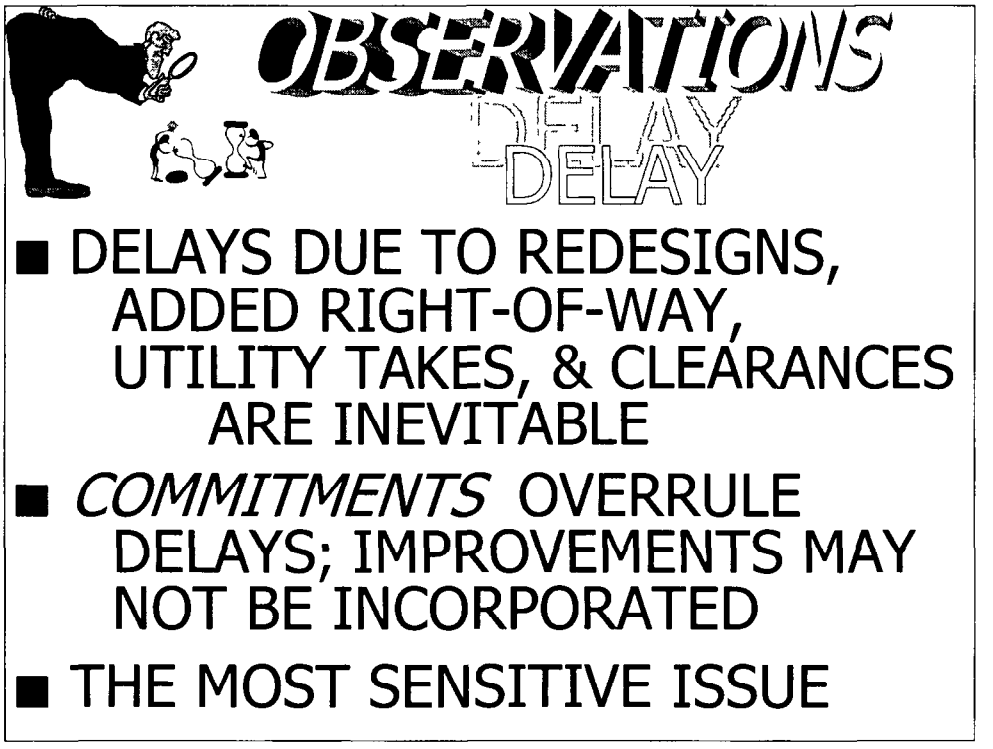


This slide also addresses COSTS.

* Any concern first raised while the contractor has begun work will most often be very costly due to being "Extra Work" Although, it will be less expensive than after the contractor is gone. Most field construction personnel did not buy into the Road Safety Audit Process due to numerous other demanding priorities during construction. In fact, one Project Engineer stated: "Sure! As soon as you guys leave, another van load will be here to see how I'm controlling my cost overruns!" Naturally, it was in fun .I think.

* Most Agencies performing Road Safety Audits consider EXISTING ROAD REVIEWS as a completely separate process from Road Safety Audits. Mostly because it is usually futile to expect that a roadway built prior to 1960 can **feasibly** conform to the safety standards of today without the benefit of a rehabilitation project. However, often a review of an existing roadway can result in a list of locations that can be improved, systematically , in a low cost manner. The risk is that the list may be long and be a Tort Liability.

* **Experience during field reviews often find ways to build things cheaper!**

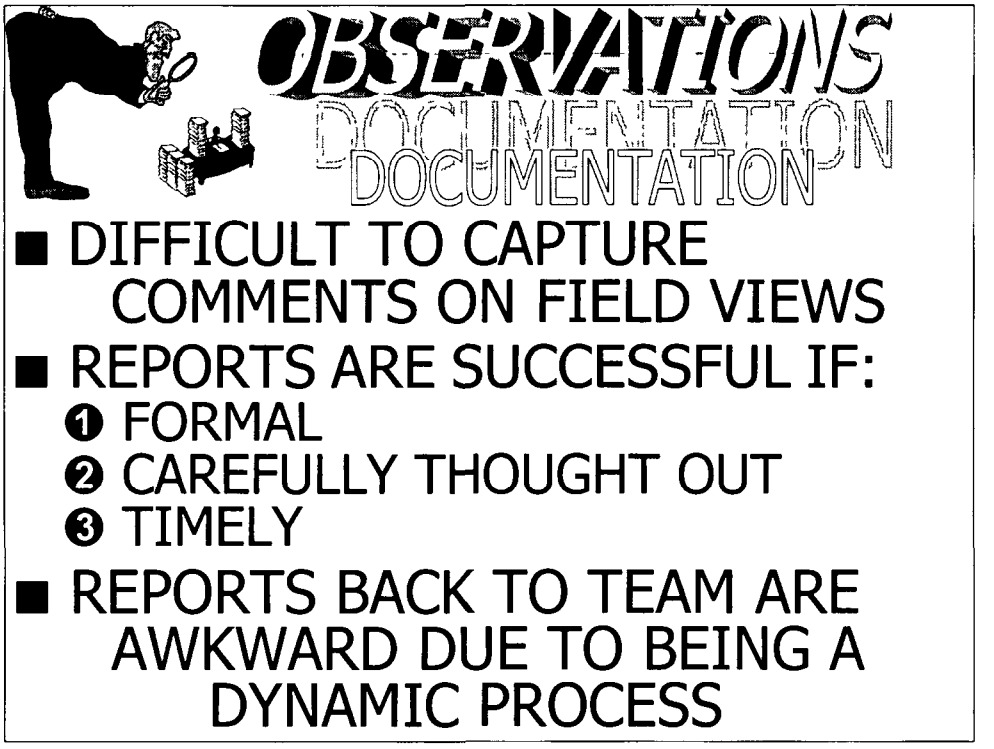


This slide briefly addresses DELAY.

* The Pilot is well accepted by all involved. Everyone knew delays may occur. It is part of buying into this "SAFETY IMPROVEMENT" Audit Process. No project had a letting missed due to redesigns. It is believed that even if any were, it would not be as troublesome as it usually is because the reasons would be justified. Concerns cited later in the project development phases will inevitably delay the design. These concerns usually resulted in incorporating the improvement that will cause the least delay. A Capital Improvement Project underwent major redesigns and is in jeopardy of even missing a major commitment because of concerns that were raised. But because the concerns are good safety concerns, the District is undergoing the major efforts necessary to incorporate the changes and possibly delay the project.

*Although delays will occur, projects were not unreasonably delayed; because, COMMITMENTS over-rode decisions to incorporate improvements. This does not suggest the Audit Process is a failure! The Team can ensure that this type of improvement will be introduced into another project at another time. Also, the lesson learned can be utilized in another project.

* Delaying the project is the most sensitive issue in the Road Safety Audit Process. Even more so than money. Money can be moved. Items can be eliminated. But time cannot be changed and commitments reflect on an Agencies credibility and are considered extremely important to uphold.



This slide addresses DOCUMENTATION.

* Field reviews are extremely valuable and are a key element in the Road Safety Audit Process. Many things are said and discussed during a field review. Typical brainstorming techniques are not easy to perform in a van during a moving field view. Also, many conflicts occur that may not get resolved during the field view. Documenting everything was extremely difficult. Do you bring a secretary? Do you take the time to write all brainstorming concerns down before you move on? Videotaping was found to be the most practical way to capture everything. This, however, requires a lot of the Coordinator's time to decipher notes afterwards.

* The Pilot tried several methods of reporting; success varied on the following:

1) Having NO FORMALREPORT caused a lack of communication and incorporation due to the Coordinator forgetting some concerns.

2) Not wanting to create a potential liability concern was a major focus for all Team Members; however, to ensure ideas would not be stifled, all Members were assured that the Formal Reports will attempt to minimize liability through careful preparation and wording.

3) The report needs to be timely so the short windows of opportunity are not missed and information is not forgotten.

* Project Owners constantly needed reminded hat a Formal Report back to the Coordinator is required. It was not because they were skirting issues. It was very difficult to determine **when** the report should be written. This was due to the dynamic process that does not occur at the same pace for the various concerns. Some are resolved quickly, some are resolved slowly, some cannot be resolved. There never really is a convenient time to respond and be assured that addenda will not be needed and tort liability is not increased.

This slide addresses project types and if they are SUITABLE for Road Safety Audits.

* CAPITAL IMPROVEMENT PROJECTS provided the most opportunities for improvements, allowed the most time in which to redesign, already involved Right of Way takes, and had more of a buffer of funding that could absorb some increases.

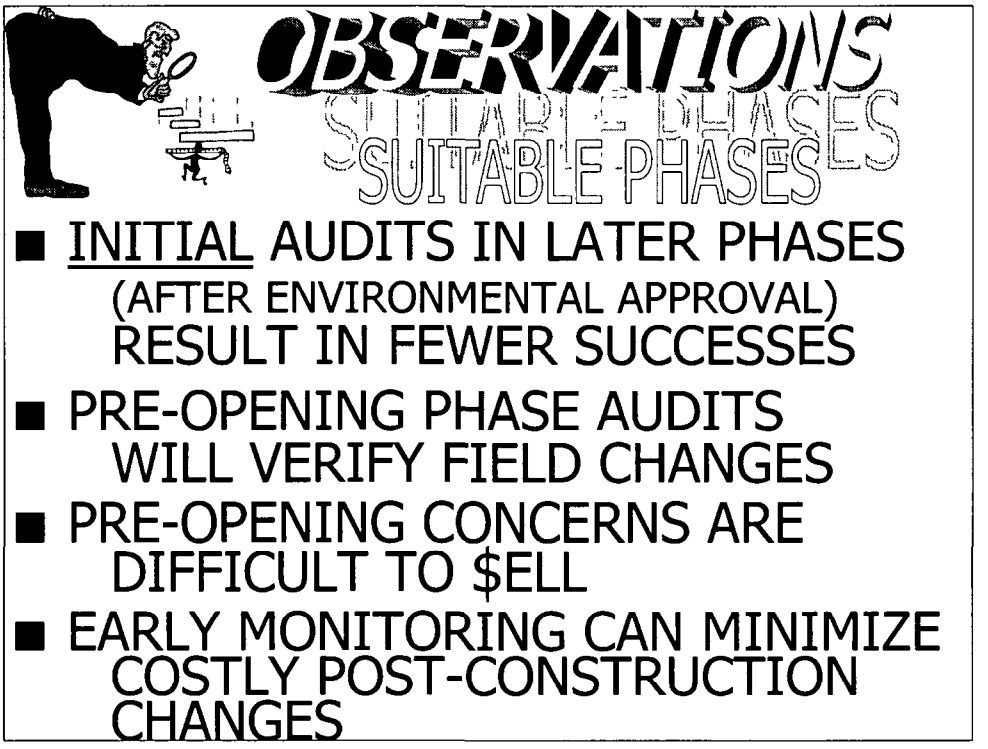
* REHABILITATION PROJECTS usually provided opportunities because the scope of work is usually broad and includes Federal funding that can be put toward the typical types of improvements that result from Audits. If you do not make improvements here, you may "miss the boat" for years to come.

* SAFETY PROJECTS did not have many concerns. This is believed to be due to a major emphasis already being on SAFETY.

* BRIDGE RECONSTRUCTION PROJECTS can go either way. The ones involving a complete rehab were found to be good ones to Audit. There is often an effort put forth to improve the alignment and some roadway work, which can create concerns and have opportunities for improvements. Other than bringing some features up to current standards, deck replacements have a very narrow scope relative to features pertaining to an Audit.

* SURFACE IMPROVEMENT PROJECTS are notorious for one thing: **"Paint her black, and don't look back!"** In other words, they are to improve ride quality and have little money available for any other improvements. They are usually funded by State monies, which are s t r e c h e d as far as possible. You will probably get little support. Ironically, this is probably where you will find the most concerns, because speeds will be increased and most design features are not improved.

* PERMIT PROJECTS usually have no lead time, receive little cooperation from property owners, and involve funding outside of the Agency, making them very difficult to acquire. Ironically, because it is not Agency money, the benefits and opportunities could be enormous. But, there is resistance with redesigns and continual reviews.



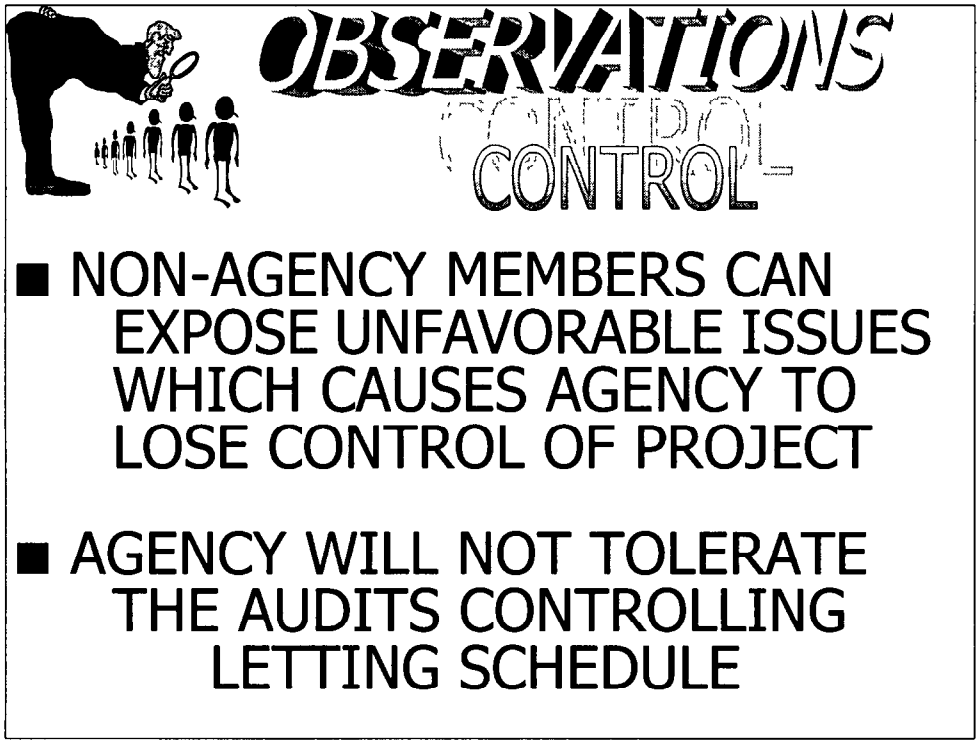
This slide addresses the PHASES OF THE DESIGN PROCESS that are suitable for the Road Safety Audit Process. The Pilot Audited numerous projects that were in the various phases of project development and monitored the experiences and results.

* It was immediately obvious that a n Audit that was initially performed in a later phase was not doomed for failure, but they did result in a fewer number of successes. The defining line appears to be the completion of the environmental approval. After this time, the amount of effort needed for major design changes is greatly increased.

* During Construction, or the Pre-Opening Phase, an Audit can be very beneficial in determining the changes that were made in the field to the design. Mostly changes of this nature were due to constructability problems which may have left no other choice but to make the change. The Road Safety Audit Team will have to expect that these changes are inevitable. But, another Audit in this phase can determine if their was a corresponding safety concern and attempt to compensate for the change. If it was a monetary decision, which are also inevitable, the Audit still allows time for the Agency to weigh the potential safety concerns against the costs associated with reconstructing now, or even worse, later after the contractor is gone.

* Concerns initially raised after construction started were very difficult to sell because of the numerous ramifications that are involved in late changes. The Pilot did not conduct many of these Audits due to initial unsuccessfulness.

* Early Audits at least stand a fighting chance to get a concern corrected because there is a construction project that can immediately address the need. The cost goes up drastically once the contractor is gone. There was a project that <u>was under construction</u> that was <u>not</u> Audited that has features that would have been cited as major concerns if they would have been Audited. The concern was raised and it was determined that the change would remain due to severely altering the project's budget. **Successfulness of an Audit depends on the TYPE of project it is and the PHASE at which you have cited the concern.**

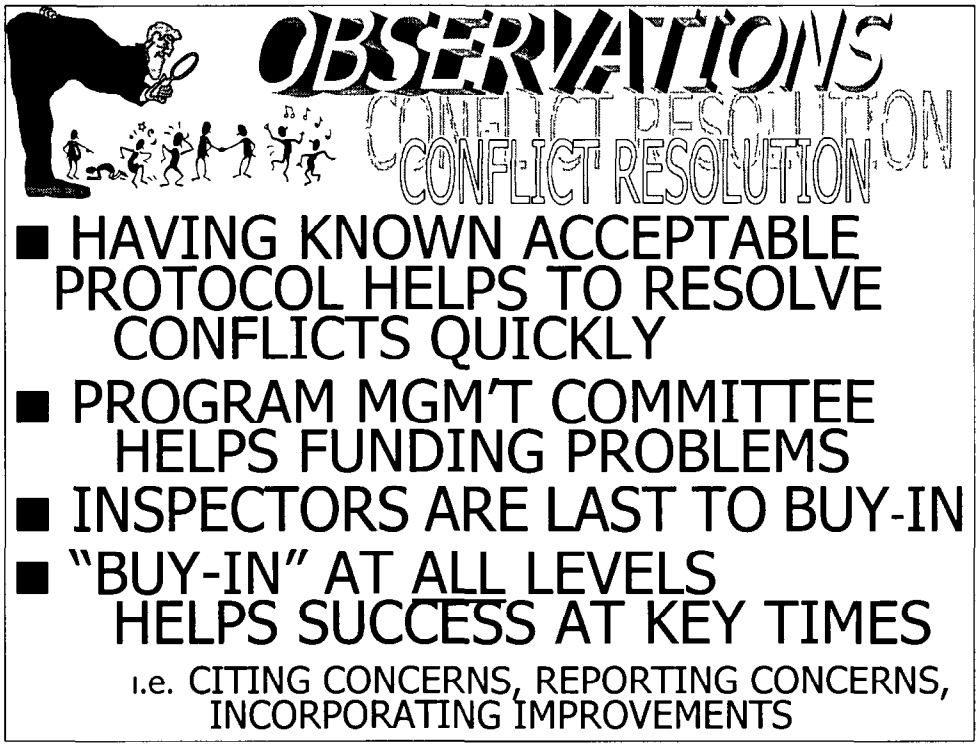


This slide addresses CONTROL.

Research of the RSA Process indicates that various Agencies prefer to have Police and other outside representatives on the Team.

* Sometimes unfavorable decisions need to be made based on all existing constraints and information at the time. This could be damaging and/or counterproductive if exposed improperly. Some non-Agency personnel may have hidden agendas that may be counterproductive, also. This issue has not been satisfactorily evaluated so far.

* **The Road Safety Audit Process will not jeopardize projects.** The improvement will not be incorporated if this is a possibility. Jeopardizing project completion will not be tolerated. This is not unacceptable even from a pure safety perspective when the overall program management perspective is considered. Some improvements may be desirable, but may not be worth delaying or losing a badly needed improvement project. The positive perspective is that this should not be an issue if the Audit Review is performed early enough in the design process. If it is not, those responsible for project management will need to make a difficult decision. Furthermore, if the improvement is not included, the Design Team or the Road Safety Audit Team will have learned from the experience.



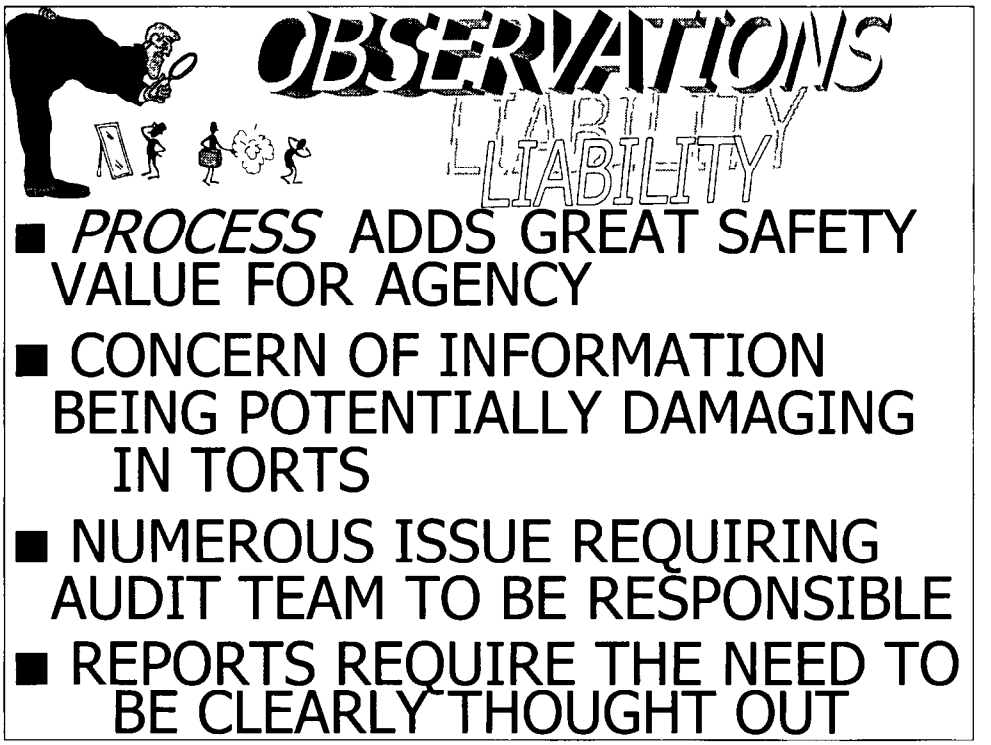
This slide addresses CONFLICT RESOLUTION both, among the Team and within the Agency.

* If everyone knows what to expect when conflicts arise, there is normally no problem. *THE TEAM MUST REACH CONSENSUS ON ALL CONCERNS SO* THAT THE CREDIBILITY OF THE TEAM IS MAINTAINED. **NO HIDDEN AGENDAS!** The Pilot only cited concerns that were unanimously accepted and conflicts that arose within the Team were fairly easily settled. District 10 had a **set and accepted** procedure prior to implementing the Pilot. All parties accepted that not everything will be completely satisfactory to everyone. Decisions were made as a Team and the Team accepted defeat. Most any kind of team grows together in success. It is very apparent in the Road Safety Audit Process because there is SAFETY involved, which is near and dear to everyone.

* Funding is always an issue. District 10 has a Program Management Committee at the Administrative Staff level that is ready to make the final determination, if necessary.

* Construction Inspectors are the last Agency personnel that need to Buy-in to the Road Safety Audit Process. They are probably the most important because they can make changes and unknowingly undo what the Team has done. Unfortunately, they are the most difficult to sell.

* BUY-IN IS A MUST! This is explained next.



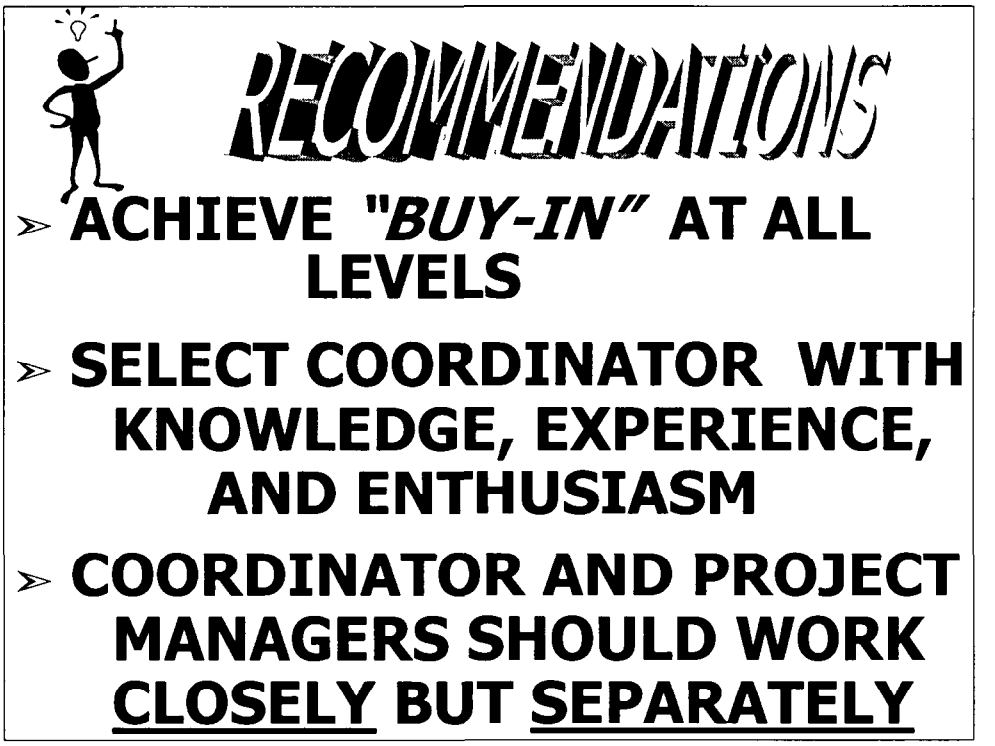
* The Road Safety Audit Process definitely adds SAFETY VALUE. Having a Process that is focused to address concerns of all varieties has to reduce tort exposure.

* Concerns that could not be adequately addressed, even for good reasons, may be damaging in future torts. Even concerns adequately addressed could be damaging in torts stemming from crashes that occurred years ago by providing ammunition for a plaintive that a problem existed. The District has not experienced a problem as of this time. The Countries that have been utilizing the Road Safety Audit Process strongly believe that everything should be well documented; however, these Countries have Agencies that are protected in courts. PennDOT is covered by Statute that allows SAFETY STUDIES to be non-discoverable. It should be noted that this Statute has not yet been tested under the Safety Audit Process. It also has not caused the Audit Team to take the shotgun approach and cite irrelevant concerns just to cite concerns.

BOTTOM LINE: HAVING A PROCESS THAT ADDS SAFETY VALUE SHOULD AID RISK MANAGEMENT AND MINIMIZE LIABILITY CONCERNS. YOU CANNOT NOT USE THE AUDIT PROCESS BASED ON A FEAR OF INCREASING TORT LIABILITY.

* PennDOT's Audit Team has been prudent and responsible when raising concerns. Concerns and/or recommendations must enhance safety, but they should also be feasible. The extreme example would be for the Audit Team to recommend a By-Pass when the scope of work of the project was to solely resurface a roadway.

* Reports need to be clearly thought out to prevent "backing the Design Team into a corner". Agencies will not manage their projects by fear of tort liability. An irresponsible report will only serve to potentially cost the Agency much needed dollars.



These next 7 slides are the presenter's recommendations from a Coordinator's point of view to any Agency that is considering implementing the Road Safety Audit Process.

* The Road Safety Audit Process can distract an Agency from their normal project development routine by adding additional reviews which usually results in changes, additions, and/or deletions of portions of the design. This can cause delays, cost overruns, and conflicts if those involved do not understand, accept, and prepare for the possibility for change. Having BUY-IN at all level of project development, i.e., District Engineer, Plans Engineering, Program Engineering, Designers, Road Safety Audit Team, Safety Review, and all other involved internal and external Units, helps to allow the Process to be effective.

* The COORDINATOR is needed to keep the Process moving and allow it to become effective for a number of projects. This involves coordinating reviews, preparing accurate comments, interacting with many Design Teams, selling safety concerns, resolving conflicts, and ACCEPTING THE RESULTS. To **effectively** do **all** of these, requires a person(s) that has KNOWLEDGE, EXPERIENCE, AND ENTHUSIASM.

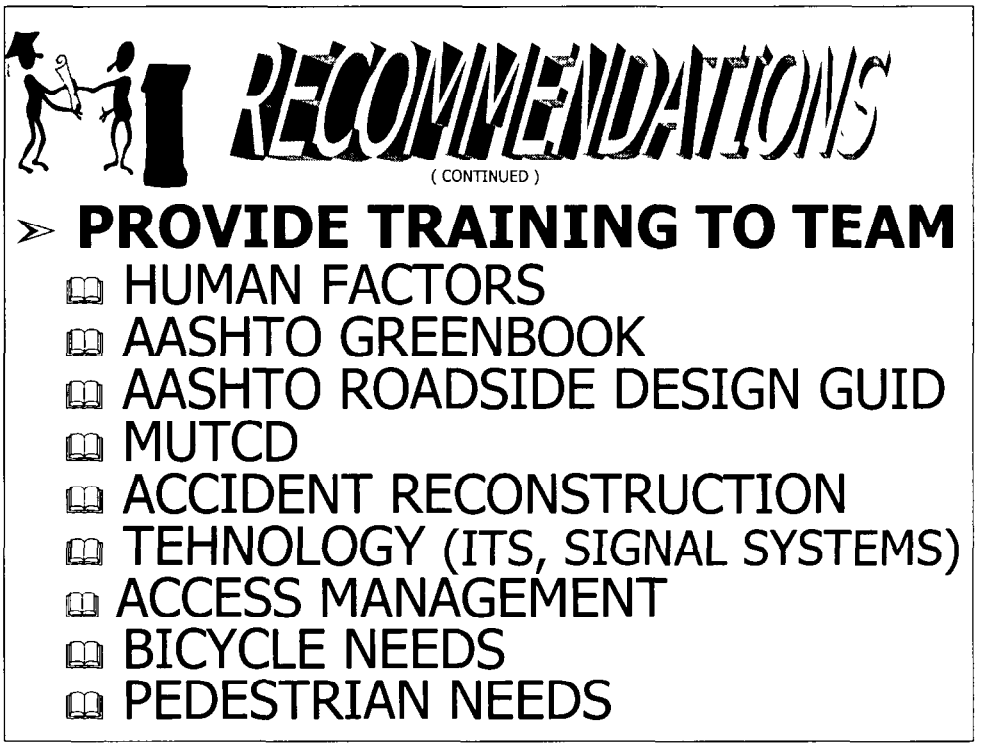
* The COORDINATOR will need to be kept up to date on all of the projects in the Road Safety Audit Review Process as the projects develop. Communication will need to occur throughout. Most of it is, simply, advising of the status of both of the functions (Design/Road Safety Audit). However, a lot of wheel spinning can unnecessarily result if this does not occur accurately and in a timely fashion. For example, a project that was in the Pilot's Audit Process had a major down scoping, i.e., from a Betterment Project (major reconstruction) type to a Surface Improvement Project (1 1/2 " of bituminous ONLY) without the knowledge of the Coordinator, which resulted in a futile field review. The Coordinator also needs to be kept current on the status of previously cited concerns. **Although, it is very important that they remain SEPARATE, so they remain excluded from normal biases and constraints.**

* A Road Safety Audit Team must be interdisciplinary so safety concerns are considered from all facets of highway engineering. Experienced personnel must be used to ensure a high quality review. A constant Team with core experience with safety principles is recommended.

* Use a SMALL NUMBER OF TEAM MEMBERS. However, they must have diverse knowledge. Too many members made obtaining consensus difficult and staying focused challenging. A large number of Team Members often prolonged reviews and left many Members with a sense of disorder.

* **Having a constant Team will continue to build experience and serve to better integrate needed safety improvements and reduce the possibility of making the same mistake, or missing the same opportunity to enhance safety, twice.** Additional members with experience in key areas should be added as needed on a project by project basis. Additional members may even help at different phases in design, i.e., Work Zone Traffic Control expert in the Construction Phase.

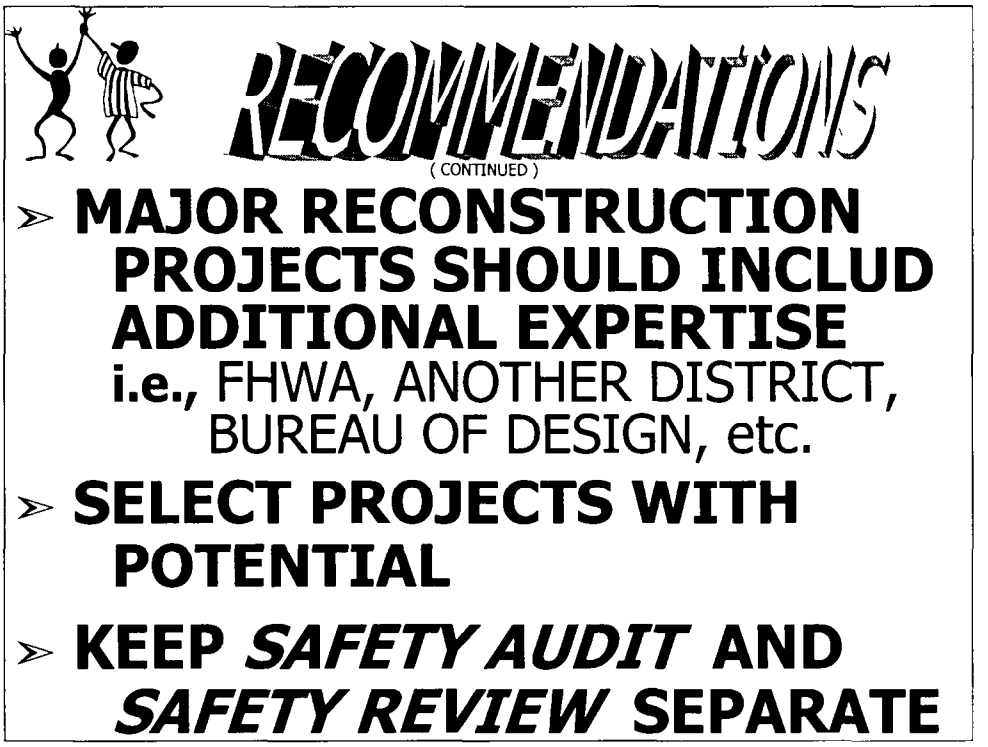
* Non-Agency members may provide valuable information; however, there is a great risk of losing control of the project by potentially allowing unfavorable information to get outside of the Agency. It may be better to search for the information offered by others through other formats.



* An Agency may not have all of the recommended expertise; therefore, training may be a need.

Training may also keep an Agency from having to acquire an expert from outside.

As Team members change, so will the needs to provide training. This is extremely important so the Team is as productive as possible. In time, expertise will build.



* New construction projects generally have less constraints and more funding which is often a rare opportunity to make extraordinary improvements that may provide a safe and efficient roadway for years to come. Expertise from outside the District can provide input of features and items that have and have not functioned safely in other areas and regions.

* Select projects that have the capability and flexibility to change. Do not set the Team up for failure!

* **SAFETY AUDIT SHOULD BE A TOTALLY SEPARATE PROCESS FROM THE NORMAL SAFETY REVIEW. Refer back to the comparison slide that outlines their differences. THEY BOTH HAVE THEIR PLACE, AND ARE BOTH NEEDED!** District 10 did not even have the Safety Review Committee Chairman on the Road Safety Audit Pilot Team to determine if a successful Safety Audit could be conducted without the biases that the Chairman may bring from working with the Design Team previously. The Road Safety Audit Process is to be independent. **In addition, knowledge of crash data is irrelevant to the Audit--The Team is looking for crash potential. Hopefully, and very importantly, crash history is being addressed by the Safety Engineer working cooperatively with the Design Team.**

*** START EARLY so you have time and ability to gain necessary funding to allow change to occur!.**

*** Give the Team a "carrot" for encouragement.**

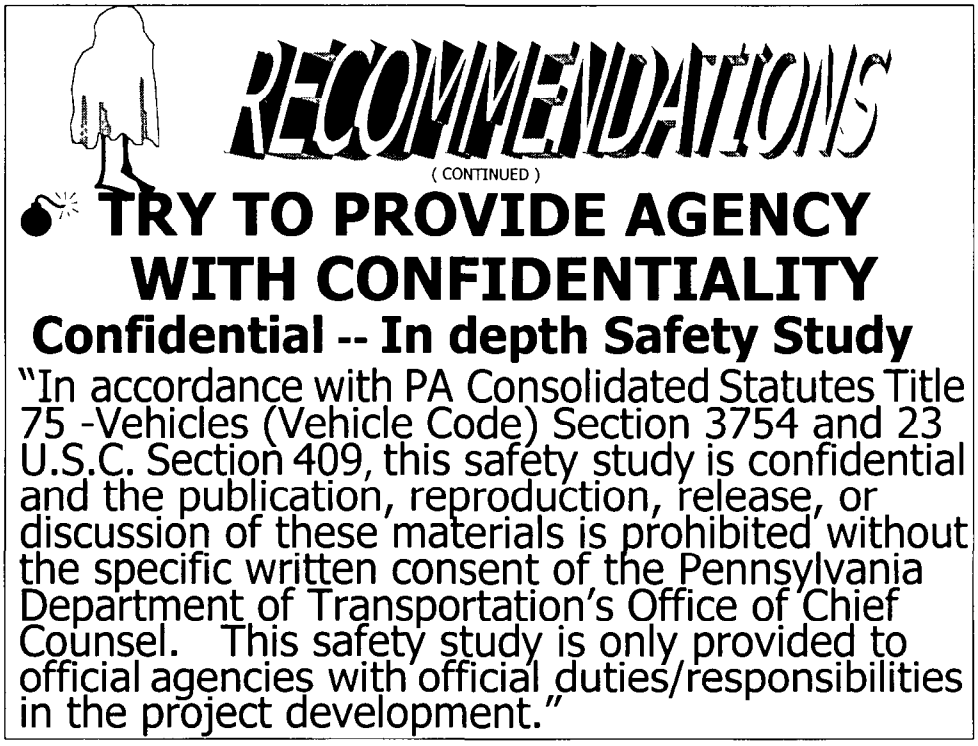
*** ENSURE QUALITY AUDITS BY:**

1) FIELD VIEW AS A TEAM. The Road Safety Audit Process depends on interaction of the interdisciplinary experts.

2) The Coordinator must be prepared so the Team remains aggressive, cooperative, enthusiastic, and informed.

3) The Project Manager will provide the best pieces of background information possible. Especially in the early phases when plans may not yet be available.

4) Video taping will ensure that all comments are captured and can allow the Coordinator to actively participate in brainstorming. This requires work after the field reviews, but ensures accuracy. The tape is also convenient if the Team needs to revisit an issue.



* Although Pennsylvania does not have Sovereign Immunity, PennDOT is protected by a Statute that deems SAFETY STUDIES non-admissible in Torts. This is a great security blanket; however, this may not be practical nor an option for some Agencies. The concern of Liability is valid, but the benefits that can be realized will outweigh the risks, if care is taken when documenting the results of the Audit.

* This is a quote of PennDOT's notification that this study should not be identified as a document that can be used in any civil tort action.

1) A FORMAL REPORT should be prepared to the project owner. The report should be prepared with care and provide the formal documentation on which decisions about corrective action will be based.

2) Reports must be carefully thought out and worded in such a way so "smoking guns" are not created by citing specific concerns that are not incorporated that may be construed as the Agency being negligent in a future tort even if the is very good reasoning for not incorporating. Not wanting to create a potential liability concern was a major focus for all Team Members. Some concerns were stifled because of this. Therefore, by carefully preparing and wording the reports, Team Members will see that they are not creating a tort liability and their ideas will not be stifled.

3) **Cite concerns not recommendations. This is one of the most important issues learned in the Pilot. Recommendations and solutions are too restrictive for the Design Team and could be the biggest cause for tort liability concerns if the recommendation cannot be incorporated.**

4) The report needs to be timely so the short windows of opportunity are not missed and information is not forgotten.

RECOMMENDATIONS

(CONTINUED)

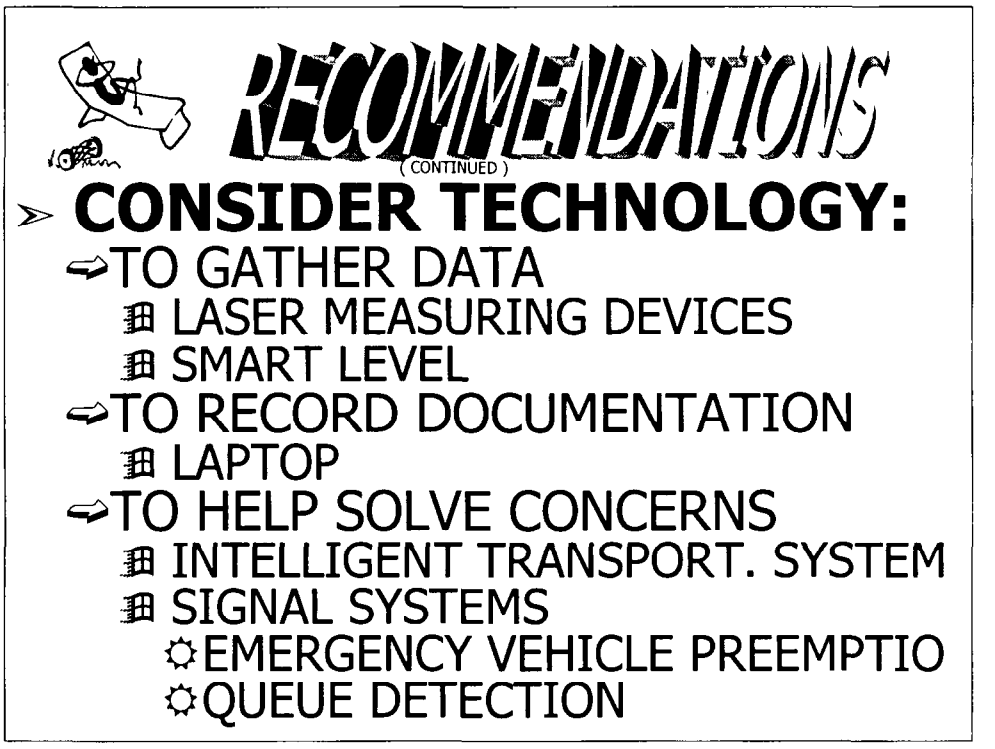
➢ **FOLLOW UP REPORT WITH MEETING TO:**

❶ CLARIFY RESULTS
❷ SELL CONCERNS
❸ DISCUSS POSSIBLE SOLUTIONS
❹ DISCUSS NEEDED ACTIONS

➢ **SET ACCEPTABLE PROTOCOL FOR RESOLVING CONFLICTS WITHIN TEAM & WITH DESIGN**

*CONDUCT A FOLLOW_UP MEETING with the project owner (Squad Leader, Project Manager, Plans Engineer, etc.). It should be used to clarify results, sell the concern, discuss possible solutions, and discuss needed actions. **This affords the opportunity to advise the project owner of details that the Team may have wanted to not include in the formal report, but did not for various reasons, such as tort liability.**

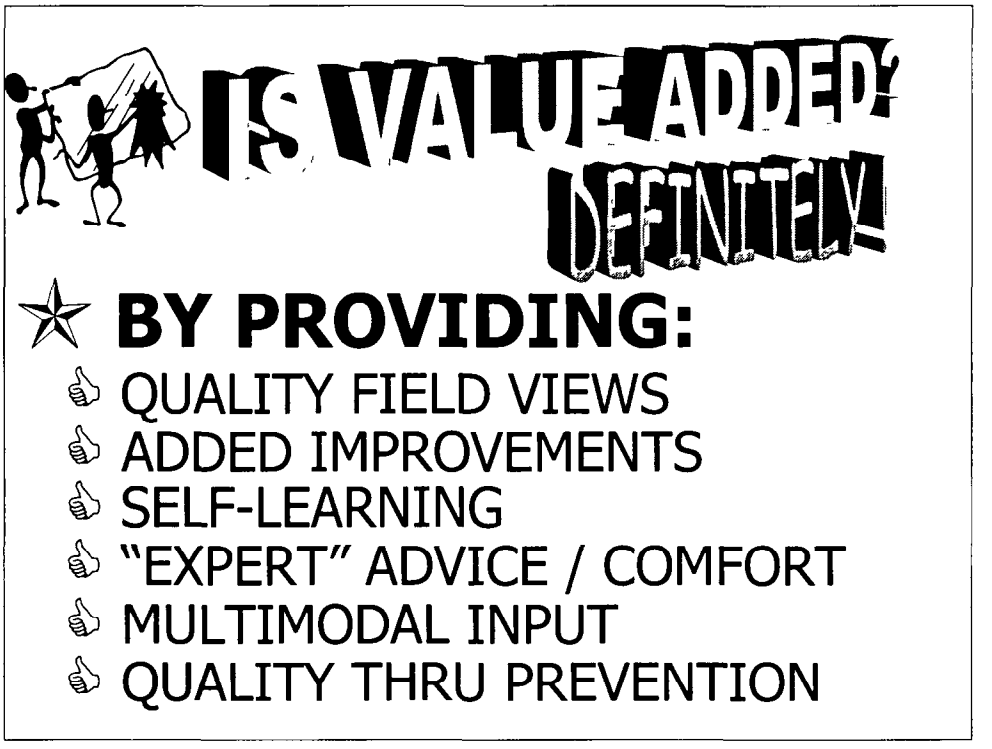
*A SET AND ACCEPTED PROTOCOL made buy-in last through adversity. The approach is that all members of the Team must agree with a cited concern. The Pilot only cited concerns that were unanimously accepted and conflicts that arose within the Team were fairly easily settled. Buy-in and an understanding of the Road Safety Audit Process helped conflict resolution among Team Members a non-issue. To be successful The Road Safety Audit Team, the Design Teams, the Programming Engineers, and everyone involved in the project development process must understand the Audit Process and know what to do when a conflict occurs. District 10 had a **set and accepted** procedure prior to implementing the Pilot. All parties accepted that not everything will be completely satisfactory to everyone. Decisions were made as a Team and the Team accepted defeat. Not all concerns will be well accepted. It helps if everyone knows what to do if issues cannot be settled. An Agency cannot afford to procrastinate because they do not know how to resolve an issue. More importantly, an Agency does not want to just drop an issue because it could not decide what to do. This is a concern that can also be a non-issue with buy-in.



* Try to ease the burdensome facets of the Road Safety Audit Process, like note taking, measurements, report writing, etc. to allow the Process to be less cumbersome and even fun. Videotaping was extremely helpful for the Coordinator in capturing all discussion. It was also used to revisit certain locations. He Team also purchased a Laser Measuring device that quickly and easily measured speeds, grades, and distances that could determine, at a touch of a button, if there is a specific concern pertaining to roadway or operation of the roadway.

* A laptop computer can speed up note taking and especially report writing.

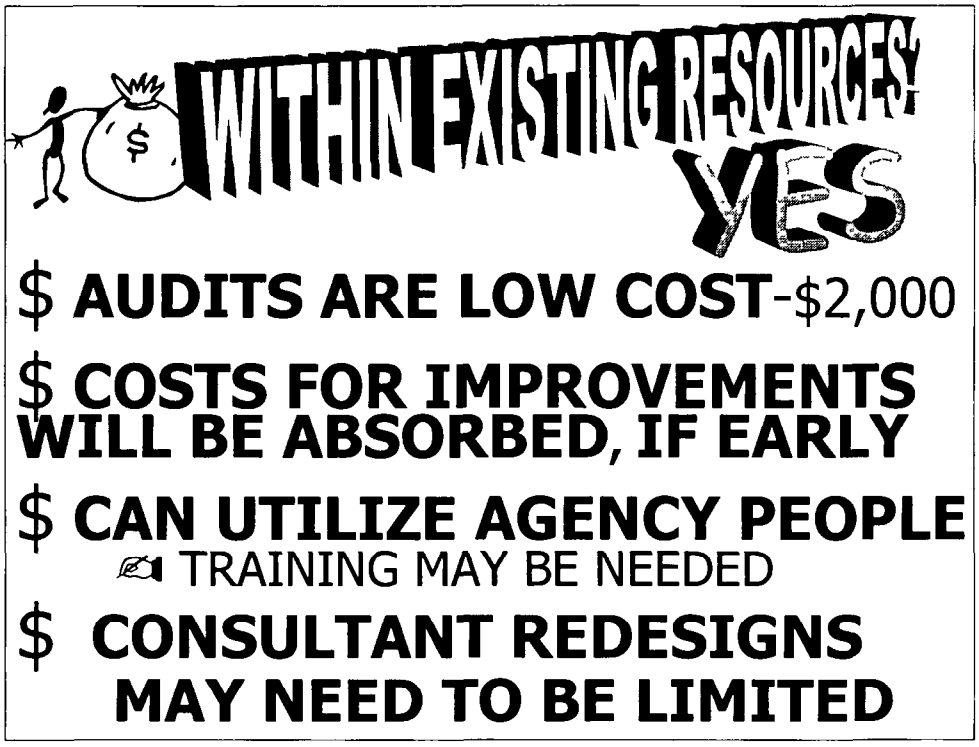
* It is important that the Team remains knowledgeable of the state-of-the-art technology that can be easily incorporated into projects to enhance safety. Examples include Intelligent Transportation System devices (Dynamic message boards for information, closed loop signal systems for congestion) and Signal Advancements (emergency vehicle preemption for EMS vehicles, queue detectors for congestion).



DOES THE ROAD SAFETY AUDIT PROCESS ADD VALUE?

DEFINITELY! Through the stated advantages.

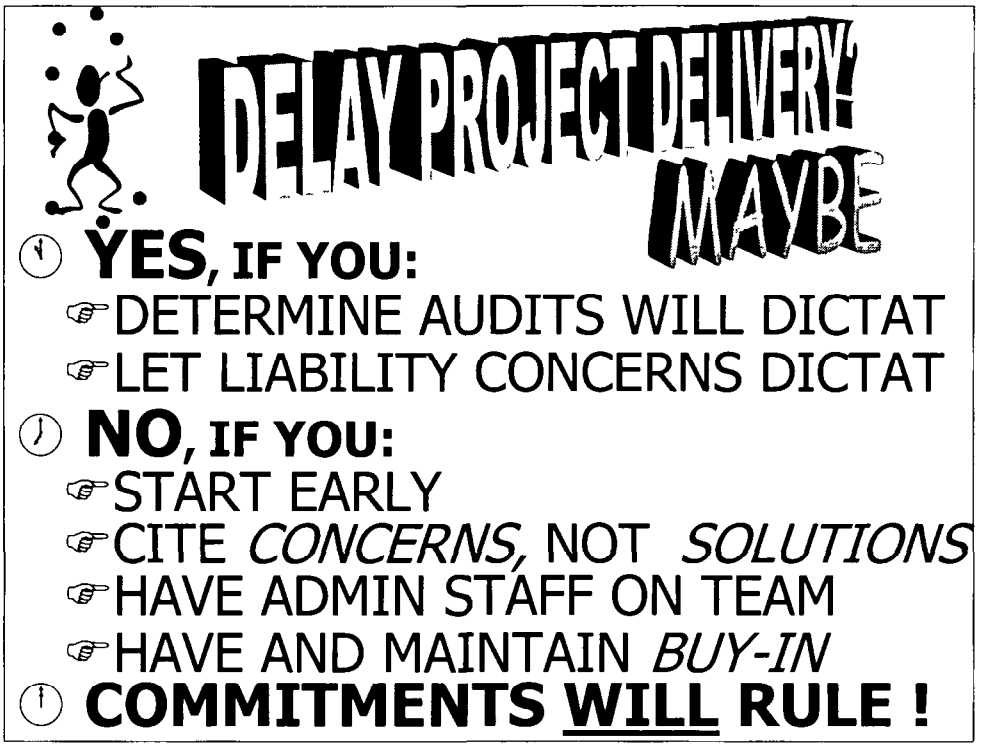
It should be no surprise that any detailed review, especially one focused purely on safety, will most likely identify safety concerns, which if corrected, will add value. The Road Safety Audit Team found potential problems associated with several types of projects in various stages of development. Efforts were made to not have the audit be influenced by the activities of the safety review committee in their performance of safety reviews. The Safety Review Committee primarily addresses adherence to standards. The Road Safety Audit Team performed a different function, one that can identify issues that would not have been discovered as part of the Safety Review whereby adding safety value. It can ensure a quality product by preventing occurrences that may adversely affect safety and be costly to repair. It can also maximize opportunities to enhance safety and minimize missed opportunities to enhance safety. With this added value, however, there is some additional risk involved as well. Does using the Road Safety Audit take the control of the project out of the hands of the Project Manager and put it into the hands of the Audit Team? Are there time problems associated with scheduling another set of meetings? What are the implications if certain concerns raised by the Audit Team are not addressed? These obstacles must be addressed through buy-in, the strengths of the individual agency, and awareness.



CAN THE ROAD SAFETY AUDIT PROCESS BE IMPLEMENTED WITHIN EXISTING RESOURCES?

PROBABLY, YES

It is estimated that the average cost of an Audit in the pilot process is $2,000 to $5,000. This cost is based on an internal review Team and includes only salary and equipment costs. This cost is comparable with estimates produced in the United Kingdom and Australia and is very little for the amount of success achieved. Audits conducted by an external Team, such as a consultant or another agency, were not used. Not all projects required the same level of effort to conduct the audit and not all projects were good candidates for audits. Improvements have added costs to the project development; however, this is not considered as a cost of the audit. This is a factor that must be considered on a project-by-project basis



WILL THE ROAD SAFETY AUDIT PROCESS DELAY PROJECT DELIVERY?

YES, if you allow the audit to be the ultimate authority or let the fear of tort liability dictate that all concerns cited will be fully acted upon. However, this is not likely to occur in many Agencies due to the vast responsibilities and limited funding.

NO, if consider the previously outlined recommendations, especially

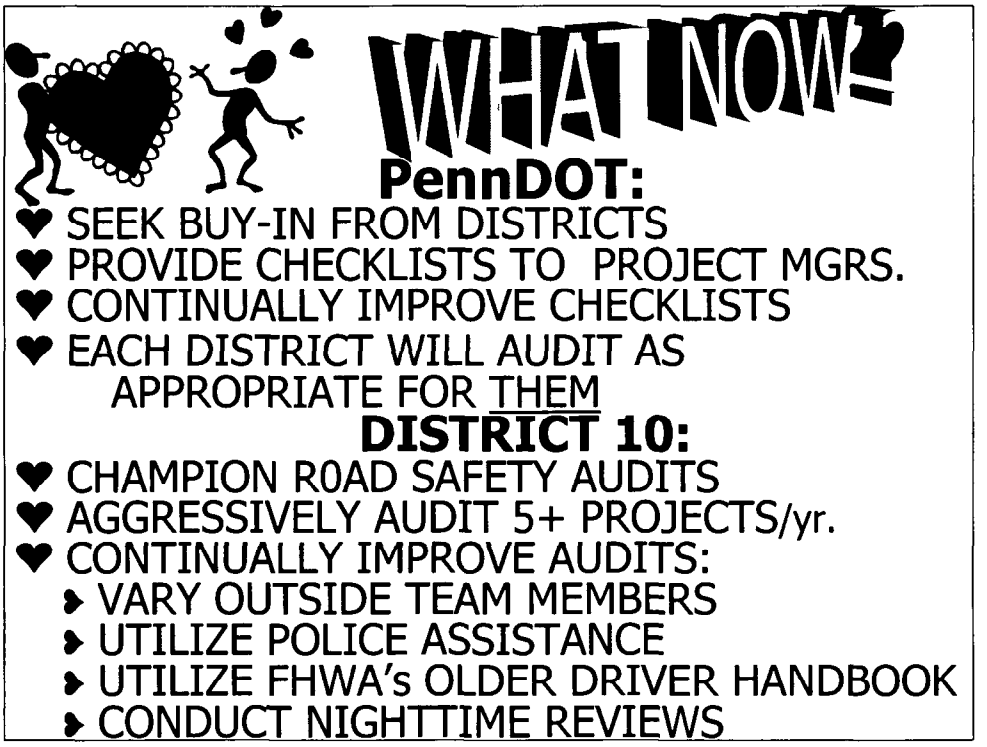
* Starting early so you have time to change

* Citing concerns not recommendations so you allow for flexibility as required by the constraints in project development

* Having high-level managers on the Team to provide stability and well rounded & knowledgeable experience.

* Having AND MAINTAINING Buy-in

Don't be demoralized if all of the audit is not totally satisfied after all of the efforts .Bottom line is that more often than not ..COMITTMENTS WILL RULE the project will probably not be delayed. HOWEVER, the Road Safety Audit is a valuable process to be used as an additional tool to allow for prudent decisions from Senior Management.



What now?

PennDOT and District 10 hope to keep the process active in the development of roadway construction projects and improve upon the next each time

PLEASE ..., if you have any questions or are considering implementing the Road Safety Audit Process and need additional background information, contact me ..I would love to hear your concerns and experiences.

THANK YOU!

PennDOT'S
ROAD SAFETY AUDIT PILOT

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